To the Graduate Council:

I am submitting herewith a thesis written by Julie E. Mathews entitled "Incorporating the Method of Scale Modeling to Supplement a Standard Method of Perspective Drawing". I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Interior Design.

Virginia Kupritz, Major Profesor

We have read this thesis and
Recommend its acceptance:

Accepted for the Council:

Associate Vice Chancellor and
Dean of the Graduate School

INCORPORATING THE METHOD OF SCALE MODELING TO SUPPLEMENT A STANDARD METHOD OF PERSPECTIVE DRAWING.

A Thesis
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ABSTRACT

The study utilizes a supplemental teaching method with a standard method of teaching one-point perspective drawing. The use of a scale model as a supplement provides increased visual and tactile stimulation to the students. This project compares differences in drawing ability between a control group and an experimental group. Both groups were given the same pre-test drawing exercise. An experimental treatment (the scale model) was then introduced only to the experimental group. Both groups were given the same post-test exercise. Small-sample inferential procedures were used to analyze the data, and a one-tailed t-test was used to determine if the experimental group's scores were significantly larger than the control group's. The results indicated that the test was significant at .05 level, supporting the rejection of the null hypothesis. Therefore, the use of a scale model appears to be effective as a supplement to a standard method of teaching perspective drawing. The scale model provides a 'hands-on' way for students to explore an environment. This type of stimulation results in better understanding of the represented environment, and better understanding can result in greater accuracy when drawing the space in perspective.

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Chapter 1.

Introduction

The goal of this study is to facilitate the production of more accurate perspective drawings by introducing visual and tactile stimulation. Perspective drawing can be made a more precise tool for communication through a heightened comprehension of the visual and tactile stimulation that shapes perceptions. Scale modeling used to supplement learning the learning of perspective drawing gives the student a greater understanding of the structure of the space and spatial relationships of objects

Significance of the Problem

Perspective drawing is an invaluable tool for both the professional designer and the interior design student. It is essential for both to be able to express graphically and communicate their design ideas and concepts (Hartmann, 1976). Inability to do so results in good design ideas being poorly understood. Verbal and written communication should be recognized as being equally important in the exchange of ideas and information (Rey-Barreau, 1983). Drawings express externally our internal mental processes (Miller, 1995). The idea that drawing ability only requires the interaction of paper, pencil, and a steady hand is a common misperception (Hartmann, 1976). Drawing ability is dependent upon the ability to accurately perceive the subject matter.

Lockard (1982) emphasizes that drawing is an ability which can be learned, and drawing talent is the unrecognized product of years of reinforced behavior. Students who have had drawing reinforced as a behavior will draw better, with little apparent effort, than the students who have not had drawing reinforced as a behavior. If perspective drawing is viewed as being more than an innate ability, but a skill which can be learned, then it is reasonable to assume that it is also a skill which can be taught.

Currently, hand drawing and computer media are the two most commonly utilized communication tools for designers, with virtual reality being in the very near future (Miller, 1995). The present research study focuses on the subject of hand drawing. Hand drawing is still a valuable and necessary tool for design, and will not be outdated by the rise of computer drawing. As a drawing tool, the computer is still as time consuming as drawing by hand (Miller, 1995). The computer will never be able to replace the *excitement* of communicating by drawing, as best illustrated by the often told tale of the designer who over lunch was able to express visual ideas spontaneously on a paper napkin (Koenig, Peter 1981).

The creation of drawing can be viewed as part of a larger process, with paper, pencil, and skill being merely tools for production (Hartmann, 1976). This larger process involves *perception* and imagination. If a person can more accurately perceive the space that they intend to render, through both *visual* and *tactile* stimulation, they will be able to translate their ideas to graphic form in a more accurate and time efficient manner (Hartmann, 1976). It is equally important to acknowledge that whatever the designers' intentions, the design will be responded to and understood through the perceptions of individuals.

Perception provides the vital raw material for thinking (McKim, 1972). McKim approaches visual thinking through experience. By experience one develops perceptions which are unique to each individual. McKim describes exercises which are intended to "unlearn" stereotypical drawing, heeding the observation of Kimon Nicolaides.

Nicolaides noted that the act of drawing depends upon correct observation achieved by using the senses in physical contact with objects (Nicolaides, 1969). In one exercise, McKim instructs the reader to begin by *not* drawing, but to first discover as much as possible about the object by viewing, touching, and smelling (McKim, 1982). Through experience, perceptions develop which shape, limit, and prejudice our acceptance of reality. By experiencing increased stimulation, the perimeters of perceptions may be broadened.

Perspective drawing is influenced by the student's perception of the space and also by the student's perception of the relationship of the objects within the space. This relationship is "spatial perception."

Objective

The study examines what effects will occur when the visual and tactile experience of scale modeling is introduced to a standard method of perspective drawing. Students may be able to develop through increased sensory awareness, a more precise understanding of spatial relationships. This knowledge will ultimately help the student, and the designer the student will become, to make informed decisions, which are based on greater understanding of space.

The project evaluates subjects' accuracy in drawing a simplified one-point perspective and subjects' accuracy in drawing a simplified one-point perspective drawing after constructing a scale model of the same space. Each space is represented by some or all of the following representational media: floor plan drawings, one-point perspective drawings, and scale models. The floor plan drawings are shown at the scale ¼"=1'-0".

The one point perspective drawings are based upon using a ½"=1'-0" scale. The scale models are constructed by using a scale of 1"=1'-0". The perspective drawings were evaluated for technical criteria. The results from the drawings preceded by a scale model exercise were compared to the results from the drawings that were not preceded by a supplemental exercise.

Hypothesis

One hypothesis will be tested. *The use of a scale model as a supplement to a traditional method of one-point perspective drawing is more effective than using only the traditional approach.* Small-sample inferential procedures will be used for the analysis of the data.

Chapter 2.

Literature Review

To achieve expertise in perspective drawing, whether by computer or traditional drawing methods, a student must first acquire the canonical knowledge (i.e. facts, rules, and applications) as a foundation for appropriate experience. Lockard lists several implications for teaching design students to draw, in order to establish design drawing or "intellectual drawing" as being distinct from art or drafting (Lockard, 1982). It has been theorized that drawing courses in a design curriculum should be taught by practicing designers who actively use drawing during the design process. Lockard (1982) emphasized the assigned drawing tasks should be more than copying, but should include elements of design for which the student is responsible. The drawing should communicate realistically design features and alternatives essential to the depicted design

Perspective Drawing as a Communication Tool

The reinvention of linear perspective in the 15th century by Italian architect Philipo Brunelleschi was not to make perspective drawings to look more realistic, but rather to introduce a method of drawing in which the artist could translate objects from one spatial language to another (Foreseth, 1991). Perspective drawing allows volumetric space (plans and elevations) to be projected into pictorial space.

Interior design is a visual art form that relies upon drawings to express ideas, convey information, and describe possibilities (Ching, 1987). Drawings are an essential communication tool which interior designers use when working with clients, contractors, and architects. Drawing can be used when words are inadequate to portray the ideas and concepts which are in the designers mind (Hoffman, 1983).

A research study conducted by Hoffman looked at the application of architectural graphics, comparing how students and practitioners ranked the applications (Hoffman, 1983). The study conducted a survey of 73 graphical applications, or competencies, including sketching in perspective, and constructing architectural models. The results indicate that of the drawing techniques, perspective drawing was chosen most often by all respondents. The construction of scale models was "rarely" utilized by either group.

To interior design educators, perspective drawing is a subject which typically is difficult to teach (Watson, 1983). It is a subject which is both complex and time consuming. The subject of perspective drawing is, however, well-documented as being essential to a comprehensive interior design curriculum (Watson, 1983). Therefore, it is necessary to look at the process itself and the ways in which it might be improved.

There are many available methods of perspective drawing. They vary in complexity and application. The techniques identified by Watson include: the office method, the plan method, grid charts, sketching or shortcut methods, and photographic methods (Watson, 1983).

Watson identified a list of criteria which the ideal method of perspective drawing would provide. First, the method would be both easy and time efficient to teach and learn. Second, the method would provide the student with a fundamental understanding of the theory of perspective drawing. Third, the method would be accurate in its portrayal of space and relationships. Fourth, the method would not require specialized equipment, and finally the method would be able to be adapted into a quick sketching technique (Watson, 1983).

A perspective drawing method identified as an *alternate method* is described by Watson. The *alternate method* combines perspective plan, diagonals and standardized grids methods to provide a way to approach perspective drawing which is fast, simple, and requires no special equipment (Watson, 1983).

Scale Modeling Method

The history of scale models can be traced back to the BC. time period. Later, in the Middle Ages, scale models were used by architects to supplement their then inadequate drawings of the great cathedrals (Pattinson, 1982). Through the history of both linear perspective drawings and scale models one similarity is clear: both are important and necessary tools for the accurate communication of ideas in a visual medium.

The idea of combining the methods of drawings and scale modeling is not a new one. Hartmann suggests the necessity of using both design sketches and models to adequately explore a design problem (Hartmann, 1976).

Forseth used models, more similar to a stage set than an architectural model , to demonstrate how he visualizes the features within the pictorial space of his renderings (Forseth, 1991). He divides the interpreted features of a rendered scene into three types of space: objective, pictorial and optical (Foreseth, 1991). The *objective space* contains tactile and audible elements such as actors and furniture. These features can be shifted around in the objective space without changing their size or shape. The *pictorial space* is likened to the middle space of a stage, defined by side wings and raked stage. In a perspective drawing the pictorial space would shape the features of the middle distance. The optical space is that which is rendered in flat frontal depth planes, such as distant mountains or skylines (Forseth, 1991). Forseth theorized that people are able to understand volumetric space by its defining objective forms, such as furniture, people, etc.

The key to more efficient perspective drawing is improved visual and tactile perception (Hartmann, 1976), and scale modeling offers stimulation of both. Pattinson (1982) defines the purpose of interior scale models as an aid toward obtaining the best spatial use, emphasizing the importance of the accuracy of dimension over the authenticity of configuration.

DeLong indicates that by experiencing reduced scale of an environment, as in scale models, subjects will experience an improved level of information processing. Research indicates experiencing a scale model method is as accurate as experiencing a full scale environment (DeLong 1976, 1977). Repeated trials establish that only a 5% variation exists between scale models and full-scale environments (Webb, 1995).

Multiple-Sensory Stimulation

Tactile-kinesthetic interaction with three-dimensional objects is one way spatial information is collected (Bach-y-Rita, 1972). Movement, also, is essential to the development of spatial cognition and perceptual development (Webb, 1995). Webb conducted a study which allowed clients to experience a tactile-kinesthetic relationship with three-dimensional space prior to its construction by utilizing the scale model method. Webb's findings support the theory that scale models allow participants to perceive more enriched and accurate sensory representation of three-dimensional space.

For accurate spatial representation to form, it is important that a person experiences multiple viewpoints of an object (Evans, 1980). Zavotka (1986) conducted a study which examined the effect of computer generated, animated graphics as a method to improve the spatial skills utilized in design drawing and analysis. The findings indicate that the increased visual stimulation provided by computer animated films, significantly improves some areas of basic spatial skills.

Chapter 3.

Methodology

Subjects were divided into two groups. Each group was given a series of tasks separated by a latency period. Results from the two groups were compared to determine if the scale model method facilitates the students' ability to understand more accurately to portray the spatial relationships in a given environment. Procedures used in the study are described in this chapter. The procedures include description of the sample population, materials used for lectures, homework, pre-test exercises, post-test exercises, construction of the representational environment (scale model), setting, and the data collection procedures.

Sample Description

The study group consisted of a convenience sample of the students enrolled in the Interior Design Program at Pellissippi State Technical Community College, in Knoxville, Tennessee. The age range of subject was 18 to 55 years of age. There was a total of two subject groups, with six subjects in one group and five subjects in the other group. Subjects were excluded on the basis of past or present accomplishments in the area of perspective drawing. This is based on the assumption that skills acquired in this area may effect ability to interpret spatial relationships into perspective drawings. The groups were stratified on the basis of drawing skills and number of semesters completed in the Interior Design Program. The stratification was determined to equalize the effects of any related drawing or interior design experience between groups. The grade point average (G.P.A.)

means for each group were similar. Group A's mean G.P.A.'s are 3.1. Group B's mean G.P.A.'s are 3.45.

Materials and Exercises

Lecture materials. Handouts relating to the fundamentals of the office plan method of one-point perspective drawing were distributed to individual subjects in the form of Xerox copies (Appendices A1.-A4.2). Overhead projector transparencies were used as a visual aid relating to the fundamentals of perspective drawing (Appendices B1.-B3.1).

Homework exercises. Black and white Xerox copies of magazine photographs were used to represent one-point perspectives (Appendices C1.1-C1.4, C2.1, C2.2). Three-dimensional computer drawings on standard white copy weight paper were also used to represent one-point perspectives (Appendices C2.3,C2.4). Two-dimensional floor plans of the space to be drawn in one-point perspective were computer drawn on standard white copy weight paper (Appendices C3.-C5.). Standard drafting conventions were used for the doors, walls, and windows. The scale used was ¼"=1'-0".

Line outlines of cubes were used to represent non-specific interior furnishings in the plan view. Dimension lines were used to indicate to precise position of the cubes in relationship to the indicated walls. Ceiling height and scale were indicated. The station point was indicated.

Pre-test exercises. Two-dimensional floor plans of the space to be drawn in one-point perspective were computer drawn on standard white copy weight paper in the homework exercises (Appendix D1.). Standard drafting conventions were used for the doors, walls, and windows. The scale used was ¼"=1'-0".

Post-test exercises. Two-dimensional floor plans of the space to be drawn in one-point perspective were computer drawn on standard white copy weight paper in the homework and pre-test exercises (Appendix D4.). Standard drafting conventions were used for the doors, walls, and windows. The scale used was ¼"=1'-0".

The three-dimensional scale model. The experimental group required materials necessary to construct a scale model (Plate 1.). The materials consisted of one 32" x 40" sheet of 1/8" white foam core board. Tools required for the construction process included stick pins or duct tape, x-acto knife, straight edge (for cutting), architectural scale, and a black marker (fine tip). Cut-out, scored patterns of scale model cubes made of 1/8" foam core board were provided to the individual subjects. Scale figures provided were constructed of the same neutral materials, and proportions were based upon basic human dimension data from Interior Design Illustrated (Ching, 1987).

Other materials. The tools used to perform the perspective drawing exercises are tools which the Interior Design Program at Pellissippi State Technical Community College require for general classroom participation. The tools consisted of architectural scale, lead pointer or drafting pencil, a t-square or parallel bar, tracing paper, and drafting tape.

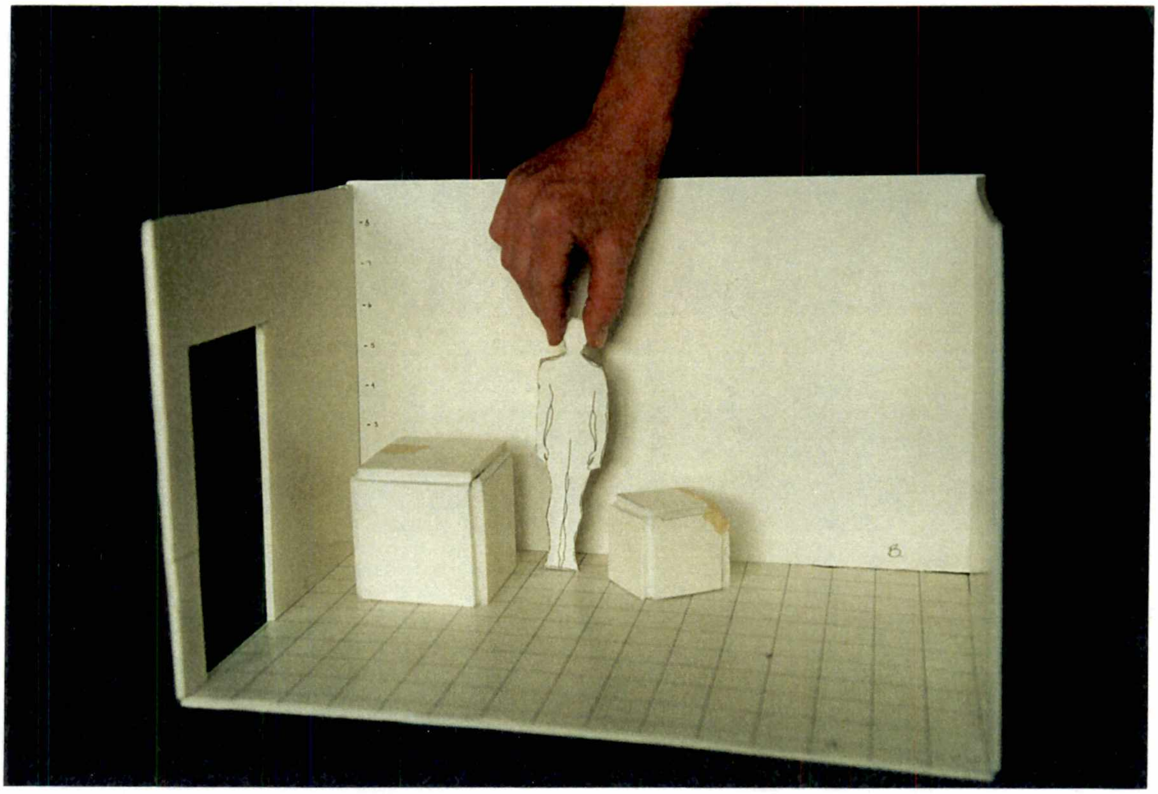

Plate 1. The three-dimensional scale model.

Experimental Procedure

Setting. The study was conducted in a large, open lab and an adjoining classroom in the McWherter Building on the Pellissippi State Technical Community College main campus. The classroom setting was equipped with drafting tables with parallel bars, overhead projectors, dry-erase boards, and large worktables.

The experiment occupied only a portion of the open lab space. Other areas of the space were simultaneously occupied by other design classes or individual design students working on projects. The visual separation of the adjacent spaces allowed for the experimental and control groups to work separately when required. The occurrence of unrelated activities provided background noise which served as acoustical privacy between groups. Lighting, acoustical and temperature levels were consistent between groups and activities because all phases of the experiment were conducted in the same space.

A series of drawing lectures and exercises were conducted to expose the subjects, novice interior design students, to the fundamentals of the office plan method of one-point perspective drawing.

Two groups participated in an experiment which was conducted over the period of five meetings (per group) during the course of 2 ½ weeks. To avoid overload of information, the research was conducted in a typical classroom schedule with one group meeting on Mondays and Wednesdays, and the other group meeting on Tuesdays and Thursdays. The separation between meeting times allows time for the subjects to learn the material and complete homework exercises.

The first four meetings were conducted as typical interior design classes, which included lecture, in-class exercises and homework exercises.

Day one. The subjects attended a lecture as a group which introduced the fundamentals of perspective drawing (D'Amelio, 1964; Yee, 1997). Each individual subject was given a handout of the definitions of terms and abbreviations used in perspective drawing (Appendix A1.). Overhead transparencies were used as visual aids for instruction (Appendices B1.-B1.7). The topic of the lecture covered general one-point perspective drawing theory and definitions, including: vantage points, cone of vision, central visual ray, picture plane, parallel lines, converging lines, horizon lines, ground plane, and ground lines.

A set of four black and white Xerox copies of magazine photographs (set 'A') was used by the subjects to perform a set of in-class exercises (Appendices C1.1-C1.4). The subjects were instructed to place an overlay of tracing paper over each photocopy. The photocopies featured various one-point perspectives. The subjects were required to identify the vanishing point, picture plane, ground plane, ceiling plane, adjacent walls. The subjects then were asked to identify if the vantage point of the camera was located to the right, left, or center of the photograph.

A homework exercise was assigned, to be completed by the next class meeting. A set of two black and white Xerox copies of magazine photographs and two black and white copies of computer generated perspective drawings were provided to the subjects (Set 'B'), (Appendices C2.1-C2.4). The subjects were instructed to identify on tracing paper the same elements they had identified for the day one in-class exercises.

Day two. The class began by review of the day one homework exercises. The subjects, as a group, attended a lecture which illustrated the application of three-dimensional cubes to represent furnishings, and the specific steps used to perform the *office plan method* of one-point perspective drawing. Information about the *office plan method* was based upon data from Leach's Techniques in Interior Design Rendering and Presentation (1978). Each subject was given a handout which outlined the procedure and a diagram (Appendices A2.-A3.1). Overhead transparencies were used to illustrate the *office plan method* of one-point perspective drawing (Leach, 1978) (Appendices B2.1-B2.4).

In-class exercises were conducted using the 'set B' photocopies (Appendices C2.1-C2.4). The subjects were instructed to use a tracing paper overlay to draw cubes around specified furnishings in the perspectives. The goal of the exercise was to reinforce the principle of converging lines which define individual objects.

Day two homework exercises were assigned, to be completed by the next class meeting. Each subject was given a copy of a computer generated floor plan, consisting of walls and a window opening (Appendices C3.,C3.1). The floor plan was drawn at ¼" scale. Interior dimensions of the walls and window opening were labeled. The subjects were instructed to construct a one-point perspective drawing of the plan in ¼" scale using the *office plan method* (Leach 1978). The station point location and ceiling height were provided in the instructions.

Day three. The class began with a review of the day two homework. Subjects were given individual feedback on their homework exercises, and allowed class time to make corrections. The subjects attended a lecture, as a group, on the placement of "skewed" objects (objects which are not parallel to the picture plane). Each subject was given an outline of the procedure and a diagram (Appendices A4.-A4.2). Overhead transparencies were used to illustrate the placement of skewed objects (Appendices B3., B3.1).

Day three homework was assigned to be completed by the next class meeting. The subjects were instructed to locate two specified objects using the one-point perspective drawing which they had constructed for their day two homework assignment. Each subject was given a computer generated floor plan drawing which included dimensioned locations of two cubes (representative of furnishings). One cube was oriented parallel to the picture plane and the other cube which was oriented at a 45 degree angle to the picture plane (Appendix C4.).

Day four. The class began with a review of the day three homework. The subjects were instructed to complete an in-class exercise. They were given copies of a computer generated floor plan and instructed to construct a one-point perspective drawing by using the *office plan method* (Leach, 1978)(Appendix C5.). The in-class exercise consisted of the same space instructions as used in homework day two and the same object placement as homework from day three. The difference in the day four in-class exercise was a change in the specified location of the station point. This exercise was conducted to give the subjects reinforcement in constructing a one-point perspective drawing , while demonstrating how changing the location of the station point changes how the perspective appears. The subjects were also instructed to construct the in-class exercises using ½" scale. This change in scale was made to accommodate the difficulty noted after the construction of the day two homework. The use of ¼" scale was determined to increase the level of difficulty experienced by the novice, being too compressed for accurate construction.

Subjects were instructed that working on the in-class exercises would be their last opportunity to ask questions and receive feedback about their drawing exercises. The subjects then were instructed that they would be required to complete the next two exercises without assistance of an instructor or a fellow student.

Day four homework (pre-test) was assigned to be completed by the next class meeting. It was again stressed to the subjects that they were not to receive any help in completing the exercise. Each subject was given a copy of a computer generated floor plan which consisted of four walls, a door opening, a cube oriented parallel to the picture plane, and a cube oriented at a 45 degree angle to the picture plane (Appendix D1.). The floor plan was drawn in ¼" scale and included indications of interior wall dimensions, door location and size, object placement and sizes, ceiling height and station point. The subjects were instructed to construct a one-point perspective drawing of the floor plan, including openings and objects, using ½" scale.

Day five. The day four homework (pre-test) was collected at the beginning of the class meeting. The class was then divided into two sections, Group A (the control group) and Group B (the experimental group).

Group A. Group was assigned to work in an area which is visually separated from Group B. Group A was given copies of a computer generated floor plan and instructed to construct a one-point perspective using the *office plan method*, to be completed during the class time (Appendix D4.). In addition to the floor plan, the subjects in Group A were given a Xerox copy of three different sized scale human figures on one sheet of standard weight white copy paper (Appendix D4.1). The subjects were instructed to choose the appropriate sized figure and place it correctly into the perspective they had drawn. After the subjects in Group A completed the exercises, they were given a written survey (Appendix E1.). The survey consisted of a series of questions relating to how the subjects perceived the spatial drawing exercises.

Group B. Group B was given written directions on constructing a scale model. The directions included a step-by-step procedure, a black and white photocopy of a computer drawn floor plan of the space in ¼" scale, and a black and white photocopy of a computer drawn diagram of the scale model (Appendices D3.-D3.2). The scale modeling instructions specified the use of 1"=1'-0" scale. After the subjects individually finished construction of the scale model, they were given a cut-out pattern of a 2" cube and a 3"cube, made out of the same material as the model (Plate 1). Subjects were then instructed to manipulate the cube patterns into three-dimensional cubes and then place them within the scale model according to instructions. Subjects were then given a scale human figure to "walk" through the space.

Finally, subjects in Group B were given copies of a computer generated floor plan and instructed to construct a one-point perspective using the *office plan method* (Leach, 1978), to be completed during the class time (Appendix D4.). In addition to the floor plan, the subjects in Group B were given a Xerox copy of three different sized scale human figures on one sheet of standard weight white copy paper (Appendix D4.1). The subjects were instructed to choose the appropriate sized figure and place it correctly on the perspective they had drawn. After the subjects in Group B completed the exercises, they were given a written survey (Appendix E2.). The survey consisted of a series of questions relating to how the subjects perceived the spatial drawing exercises, and the scale modeling exercise.

Chapter 4.

Results

Statistical Procedures

The experiment involved 11 subjects, divided into two groups, which met on two different sets of days: Monday-Wednesday (MW) and Tuesday-Thursday (TR).

During the experiment, all subjects experienced the same sequence of lecture materials and preliminary exercises, conducted in the manner of a typical interior design classroom situation. The sample was divided into two groups: Group A, the control group, and Group B, the experimental group. All subjects were given a two-phase test. The first phase was the pre-test exercise which was conducted simultaneously with both Group A and Group B. The pre-test consisted of a floor plan to be drawn in a one-point perspective. During the second phase, Group A subjects completed a post-test exercise which consisted of a floor plan to be drawn in a one-point perspective, followed by the placement of a scale model person into the drawing. Group B subjects participated in a scale modeling exercise, followed by the same post-test drawing exercise as Group A (Table 1.). The observations to be evaluated by this project were differences between pre-test and post-test scores.

Hypothesis to be Tested

The present study tests the null hypothesis that there is no difference in the effectiveness of experiencing supplemental scale model exercises than the traditional teaching method. (H_o: μ_E-μ_{DC}=0). If the null is rejected, then the alternative hypothesis is accepted that the scale model approach is more effective than the traditional approach (H_a: μ_{DE}-μ_{DC}>0).

Table 1. Experimental Conditions Sequence.

Experimental Design	Control Group A (MW and TR)	Experimental Group B (MW and TR)
Pre-Test	Perspective Drawing Exercise	Perspective Drawing Exercise
Treatment		Scale Modeling Exercise
Post-Test	Perspective Drawing Exercise with Scale Figure Placement	Perspective Drawing Exercise with Scale Figure Placement

Evaluation Criteria

The drawing exercises were collected and evaluated for technical accuracy. Concentration on only the technical points prevented the data from being influenced by subjectivity. Points for correctness were given only if the criteria was met 100%. No points were given for partial correctness and incorrectness. Table 2. illustrates the evaluation criteria.

Testing for Performance Differences Between Groups

Small-sample inferential procedures were used for the analysis of the data. The initial analysis was conducted to determine if there were differences between the Group A (control) and Group B (experimental), by comparing the differences between pre-test and post-test scores. A one-tailed t-test was used to evaluate whether Group B's differences were significantly larger on average than Group A's.

This project assumed that group A and group B are independent, with random samples of sizes 6 and 5 respectively, and are drawn from two populations which have means and variances μ_{DE}, σ_{DE}^2 and μ_{DC},σ_{DC}^2.

Table 2. Evaluation criteria.

Feature	Criteria	Points
WALLS	1. Height x length	5
	2. Alignment of construction lines to the V.P.	5
WALL OPENING	3. Placement	10
	4. Height x width	10
	5. Alignment of construction lines to the V.P.	10
PARALLEL OBJECT	6. Placement	10
	7. Height x width x depth	10
	8. Alignment of construction lines to the V.P.	10
SKEWED OBJECT	9. Placement	10
	10. Height x width x depth	10
	11. Alignment of construction lines to the V.P.	10

The objective is to make inferences concerning the difference between the two population means, $\mu_{DE}-\mu_{DC}$. Although the t-test is fairly robust to the assumption of normality, the test assumes that both populations possess a normal probability distribution and that the population variances are equal. These assumptions, if H_o is true, imply that

$$t = \frac{\overline{D}_E-\overline{D}_C}{S_P\sqrt{1/N_E+1/N_C}},$$

the test statistic, has a Student's t distribution where D_E is the mean difference between pre-test and post-test scores of the experimental group and D_C is the mean difference between pre-test and post-test scores of the control group, and where

$$S_P^2 = \frac{(N_E-1)(S_{DE})^2 + (N_C-1)(S_{DC})^2}{N_E + N_C - 2}$$

is the pooled estimate for the variance. $(S_{DE})^2$ is the variance of the differences for the experimental group and $(S_{DC})^2$ is the variance for the control group. The null hypothesis will be rejected at a .05 significance level if:

$$t > t_{.05,\, NE + NC - 2}$$

Data Analysis

Table 3. shows the differences computed between Group A (control) which consisted of 6 subjects and Group B (experimental) which consisted of 5 subjects.

Table 3. Comparing differences between pre-test and post-test scores.

	Mean Pre-Test Score	Mean Post-Test Score	Mean Difference	Std. Deviation of Differences
Group A (Control)	76.7	71.7	-5	14.14
Group B (Experimental)	57	70	13	12.04

The calculations for the critical region:

$$t > t_{.05,\, NE+NC-2} = t_{.05,\,9} = 1.833$$

The pooled estimate of the variance is:

$$S_P^2 = \frac{(N_E-1)(S_{DE})^2 + (N_C-1)(S_{DC})^2}{N_E + N_C - 2}$$

$$= \frac{4\,(12.04)^2 + (5)(14.14)^2}{9}$$

$$= 175.5049.$$

and $$S_P = 13.2478$$

and the test statistic is:

$$t = \frac{\bar{D}_E - \bar{D}_C}{S_P \sqrt{1/N_E + 1/N_C,}}$$

$$t = \frac{13 - (-5)}{13.2478\ \sqrt{1/5 + 1/6}}$$

$$= 2.24$$

Since the calculated value of t, 2.24, is larger than the critical value of 1.833,the data support the rejection of H_O in favor of H_a. This indicates that the use of a scale model is effective as a supplement to a standard method of teaching perspective drawing.

Scale Figure

The placement of a scale figure into the perspective drawing was included in the post-test for both Group A and Group B. The subject's placement choice was evaluated as being correct or incorrect. The intent of this exercise was to determine if experiencing the scale model would increase the subject's understanding of spatial relationships. Frequency analysis of the percentage of correct responses indicates that the scale figure did not supplement the subject's understanding of spatial relationships in this context. Frequency response rates for the two groups are summarized in Table 4.

Survey Data

After completion of the post-test exercise, both groups were given a written survey consisting of questions relating to their perception of spatial relationships. Incomplete responses resulted in an insufficient set of data to analyze statistically. Table 5 summarizes the data collected.

Table 4. Percentage of correct selection of scale figure.

Post Test	Percentage of Correct Choice
Group A (control)	66.7%
Group B (experimental)	20%

Table 5. Summary of survey data.

	Group A (control)	Group B (experimental)
Noted using a different sized scale figure after completing the spatial exercise(s)	16.7%	33.3%
Experienced a surprise in the portrayal of spatial relationships.	33.3%	66.7%
Did not experience surprise in the portrayal of spatial relationships.	33.3%	33.3%
Found the scale model to be helpful as a supplement to perspective drawing.	NA	66.7%
Did not find the scale model to be helpful as a supplement to perspective drawing.	NA	33.3%

The survey was composed of open-ended questions (Appendices E1.,E2.). Observations made by the subjects in group A (control) included comments regarding surprise at the portrayal of objects drawn in perspective, indicating the experience was… "very different, [because] you don't just see tops of boxes…[but rather] see the whole object." Some students indicated the degree of difficulty required to master this complicated drawing task as being "a lot to learn in a short time."

Observations made by the subjects in group B (experimental) included comments on the portrayal of spatial relationships in the scale model, focusing in particular on "relationships of objects, especially heights." One subject noted being able to transfer the way height was indicated in the scale model and apply it to the drawing, commenting that "his [scale model figure's] head cleared the door by about a foot- so in the drawing I saw the largest figure fit the same way as the figure in the model." The majority (66.7%) of respondents to the survey did feel the scale model was helpful, and it was indicated by one subject that they "would like to do more modeling in [the] future with interesting shapes."

It should be noted that for future application, the distribution of a questionnaire type survey should include explicit instructions regarding the completeness of answers. This survey resulted in incomplete information because many subjects left questions unanswered, however, this condition does not appear to threaten the internal validity of the study. The survey was not crucial to testing the hypothesis. It was intended to collect additional insight into how subjects perceive spatial relationships in different contexts. Also, the stipulation for subjects to turn in their questionnaires anonymously assumed that the result would yield a greater honesty of response. Instead it resulted in some subjects taking advantage of this anonymous state and not completing the survey.

Chapter 5.

Conclusions

The results of this research project have exciting implications. First, significantly improved performance of the subjects who participated in the scale modeling exercises indicates that scale modeling used in this context seems to improve spatial perception. A second issue is the failure of scale model figures to aid in proper choice and placement of human figures into perspective drawings in this study.

The Relationship between Scale Modeling and Perspective Drawing

When students experience a scale model used to represent an environment, the scale model provides visual and tactile, 'hands-on' way for the student to better understand that environment. The research findings show that the students are then able to transfer what they learned from the scale model to another type of representational environment, a perspective drawing. Therefore, one can assume that incorporating the scale modeling method into a perspective drawing curriculum may improve drawing accuracy depicting spatial relationships.

This improvement in the accuracy of a student's drawing is not limited to being an educational tool. What the scale modeling gives the student is a greater awareness of spatial relationships in general, and it is reasonable to assume that greater awareness will also impact the choices the student will make as an interior designer. The ability of the interior designer to make informed choices during the preliminary design stages can result in fewer costly mistakes which have to be corrected after the design is realized.

The scale model is an established tool which is used by designers and researchers alike. It has been proven as an aid for space planning, and determined to be accurate in portrayal of full scale environment in behavioral research. The conclusion that the scale model appears to be an effective supplement to perspective drawing demonstrates the continuing impact and potential the application of scale modeling has.

The Use of Scale Model Figures

Scale model figures are established as being the typical medium through which one interacts with a scale model environment. It allows participants to establish how "they", conveyed through the use of the figure, relate to the objects and structure of the representational environment. However, subjects in this study who experienced a scale model did not successfully apply the knowledge to the selection and placement of an appropriate sized human figure into a perspective drawing.

The reason why the scale model exercise did not result in improved placement of a figure into perspective drawing is unclear. A possible explanation, warranting further research, may deal with the transference of information. As mentioned earlier, the scale model environment is perceived as being the same as the full-sized environment. The literal transference of spatial relationships from the scale model environment to the perspective drawing environment (in particular as height) may result from the lack of basic understanding about the premises of perspective drawing. The relationship between objects in the scale model environment depicts and accurate representation of the full-scale environment. However, the relationship between objects in a perspective drawing is altered by the principles of converging and diminishing lines. Objects drawn toward the foreground of a perspective drawing appear larger, while the same sized objects drawn in the background appear smaller.

In conclusion, the potential use of the scale model as a teaching tool for perspective drawing in the interior design profession has yet to be realized. It is an established tool for behavioral research that can be easily incorporated into a drawing curriculum for design. The results of this research project indicate that the scale model is an effective tool when used to supplement teaching perspective drawing. Further research is warranted to identify other possible teaching applications of the scale model. One such application would be to examine the degree of benefit the scale model provides individual students. Students vary in their ability to learn, understand, and perceive spatial relationships. It is possible that the scale model will be the most beneficial to the students who have the greatest degree of difficulty. Consistently, research validates the ability of scale models to provide increased stimulation which in turn, allows the perimeters of human perceptions to be broadened.

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APPENDICES

APPENDIX A

CLASSROOM HANDOUTS

CONTENTS—APPENDIX A

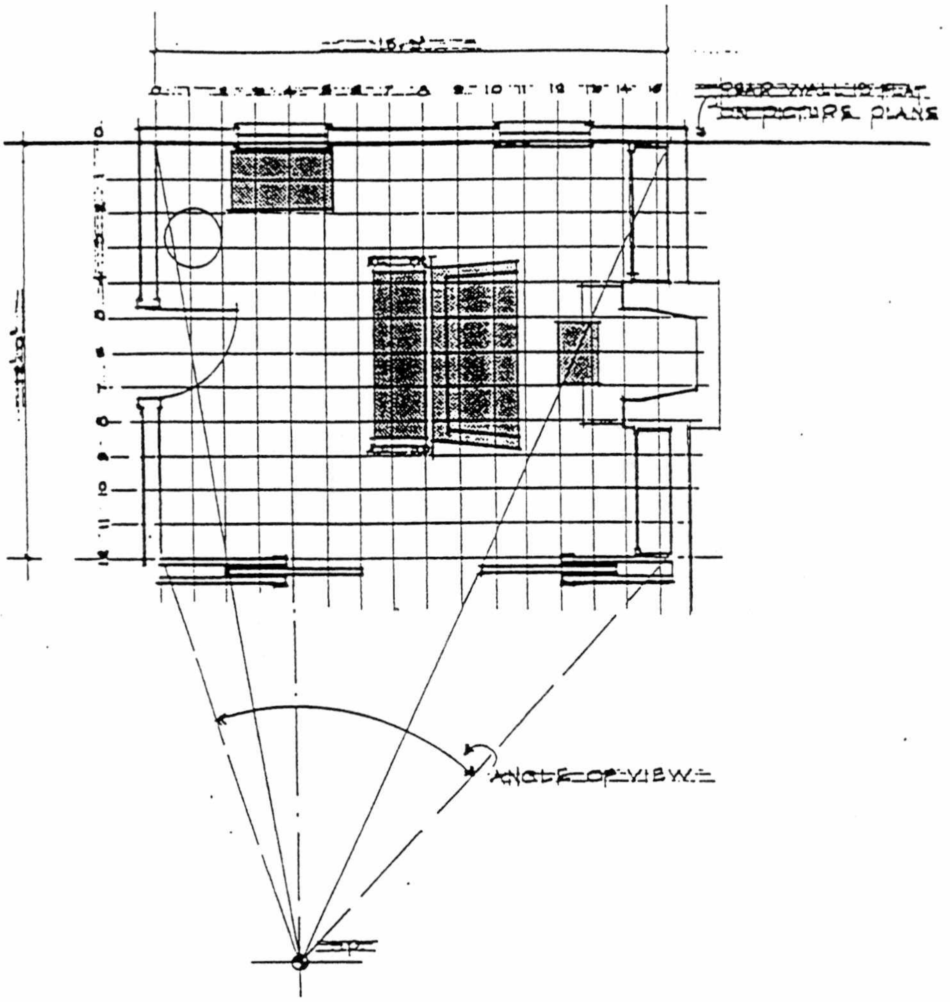
Two of the most accurate mechanical methods for generating linear perspectives are shown in this chapter. They are the plan elevation (office) method and the measuring point method. Linear perspective drawing is a tool for the designer or delineator to make a reasonably accurate representation of a three-dimensional object on a two-dimensional surface (the drawing sheet). A linear perspective drawing is an image of an object projected upon an assumed plane (Picture Plane-PP) that is parallel to the observer's face or eyes. When used as a representational tool for the design–drawing process, it is of utmost importance not to misrepresent the physical appearance of buildings with inaccurate perspective representations. The following are the most commonly used terms in the vocabulary of perspective drawing techniques.

TERMS	ABBREVIATION	DEFINITION
Station Point	(SP)	• A vantage point location to view an object or group of objects; the location of the observer's eye.
Picture Plane	(PP)	• A stationary, transparent, two-dimensional, vertical plane or "window." This window receives a true-size image from the projection lines which converge to the station point. Perpendicular to the observer is the line of sight.
Line of Sight	(LS)	• An imaginary line that perpendicularly intersects the vertical picture plane as it is projected from the observer's eye (station point).
Horizon Line or Eye-Level Line	(HL)	• Represents the observer's eye level. The horizon line is recorded on the picture plane. It is the vanishing line for all horizontal lines and planes.
Ground Line	(GL)	• The line where the picture plane and the ground meet. The ground line lies within a ground plane from which vertical measurements are made.
Vanishing Point	(VPL, VPR, and VP_o)	• A point on the horizon line where any group of parallel horizontal lines converge in perspective. Groups of oblique (inclined) parallel lines vanish either above (sloping upward) or below (sloping downward) the horizon line. Parallel lines that are parallel to the picture plane do not converge.
Vertical Measuring Line	(VML)	• A vertical line within the picture plane. Vertical height dimensions are transferred from an elevation to this vertical true-length line in order to be projected into the perspective drawing.
Midpoint	(M)	• A point located on the horizon line that lies half way between the vanishing points in a two-point perspective.
Horizontal Measuring Line	(HML)	• A horizontal line lying in the picture plane, which therefore is a true-length line.

PERSPECTIVE GLOSSARY

Yee, R. (1997). Architectural Drawing: A Visual Compendium of Types and Methods. New York: John Wiley & Sons, Inc.

A1. Handout for Day One

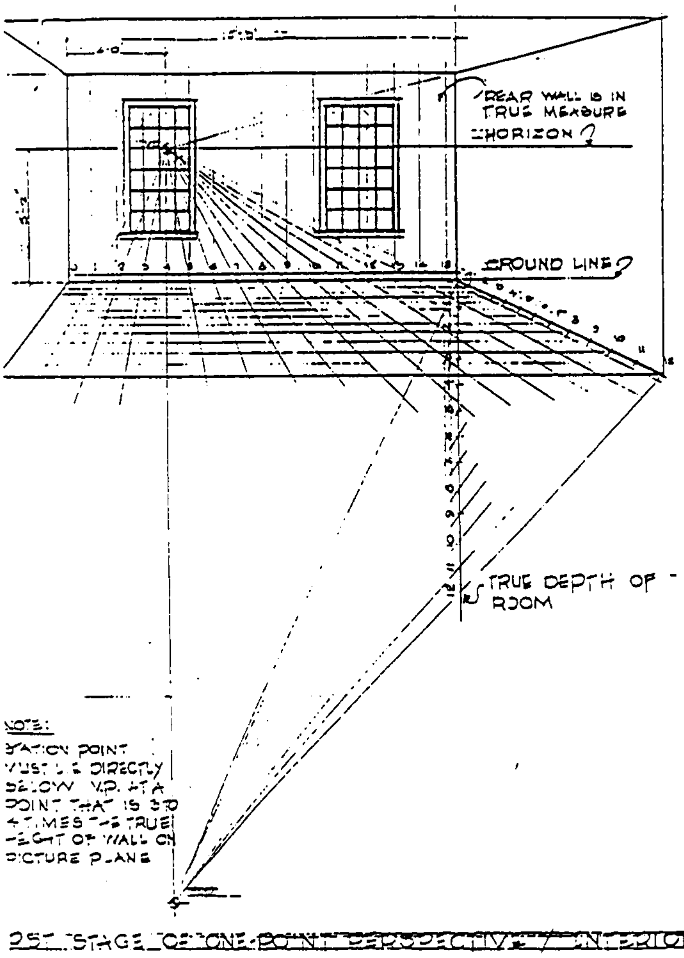


PLAN WITH GRID OVERLAY

FIGURE 5-5: In one-point perspective of an interior, the floor plan lies in front of the picture plane with the rear wall of the room flat on the picture plane.

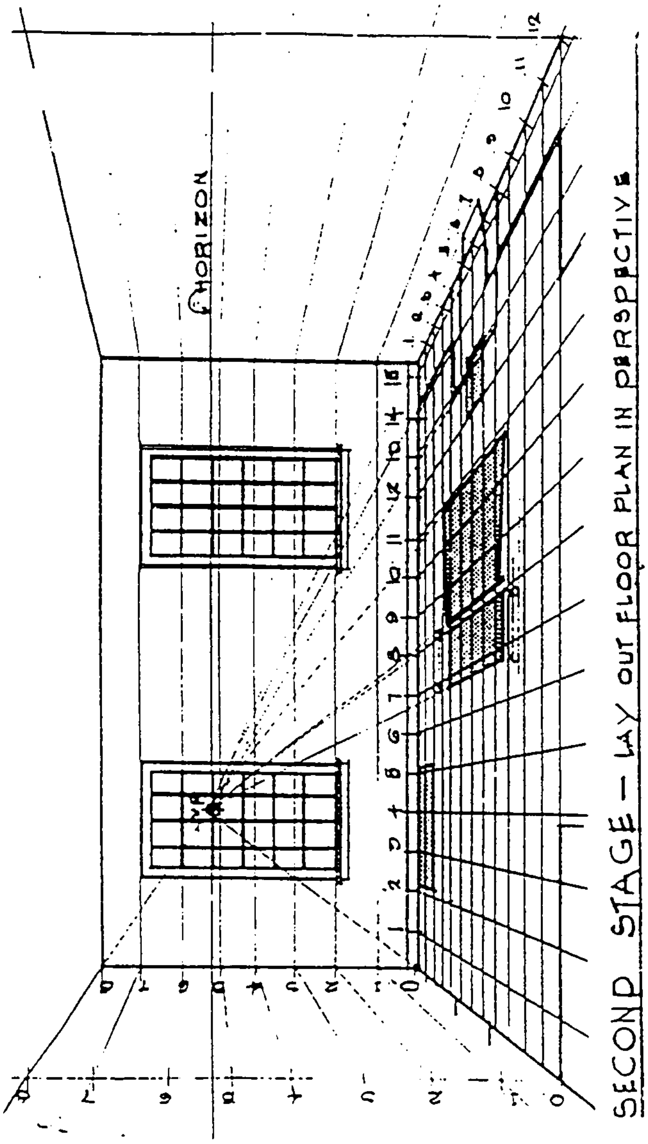
Leach, Sid DelMar (1978). Techniques in Interior Design Rendering and Presentation. New York: MacGraw-Hill.

A2. Handout for Day Two- Plan with Grid Overlay



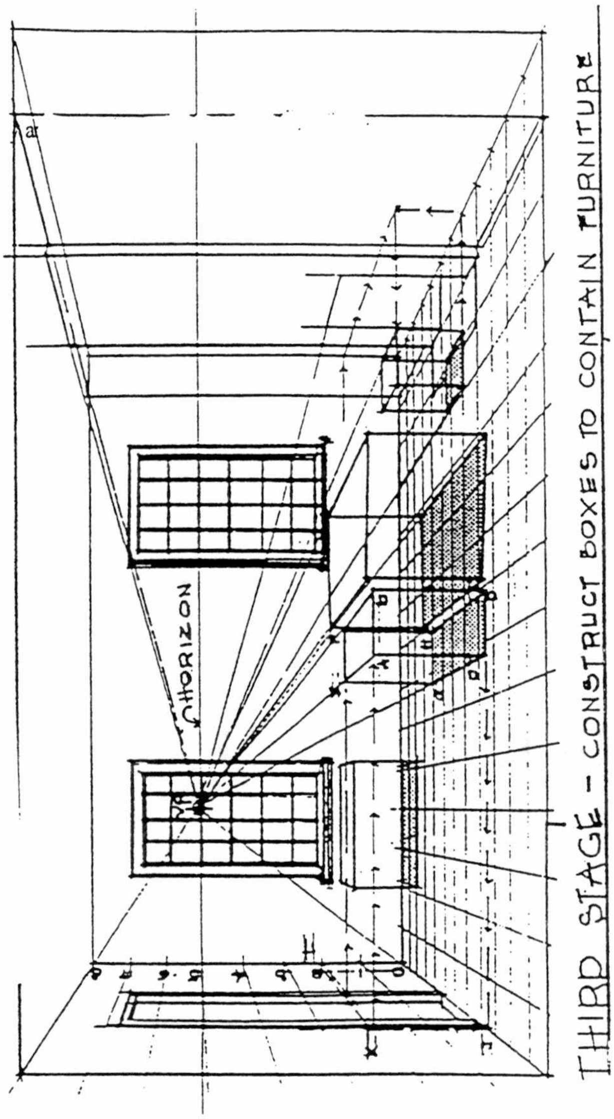
Leach, Sid DelMar (1978). Techniques in
Interior Design Rendering and Presentation.
New York: MacGraw-Hill.

A2.1 Handout for Day Two- First Stage of One-Point Perspective



Leach, Sid DelMar (1978). Techniques in Interior Design Rendering and Presentation. New York: MacGraw-Hill.

A2.2 Handout for Day Two- Second Stage



Leach, Sid DelMar (1978). <u>Techniques in Interior Design Rendering and Presentation.</u>
New York: MacGraw-Hill.

A2.3 Handout for Day Two- Third Stage

ONE POINT PERSPECTIVE

1. Position the floor plan, drawn to scale, in front of the **picture plane**. The rear wall of the floor plan should coincide with the picture plane.

2. Establish a **station point** in front of the picture plane. The station point should generally be 3 to 4 times the height of the rear wall.

(example: If the rear wall is 9'-0" tall, then use a station point which is 27' or 36' in front of the picture plane)

The station point can be in the center, or it can be positioned to the left or the right until it is felt a desirable picture would result.

3. Once the station point has been established, then start a second drawing. Start by drawing an elevation of the rear wall, **in scale**, on the picture plane. Divide the floor line (ground line) into 1 ft. segments, using the same scale. Draw a horizon line 5'-5" in above the floor line.

4. Position the one **vanishing point** directly above the station point and on the horizon line.

5. Place a push-pin in the table through the V.P. This will serve as a pivot point to which all lines that are not horizontal or vertical will converge.

6. Establish **room boundaries** by extending a line from the V.P. through the four corners (of the rear wall) in front of the P.P. Extend lines forward through each 1ft. mark along the floor line radiating from the V.P.

7. Extend the right corner of the rear wall vertically below the G.L. a distance (in true measure) equal to the depth of the room, or 12'.

8. Mark vertical 1ft. divisions on this extension.

9. Extend lines radiating from the S.P. through each mark on the extended vertical corner until they intersect the wall/floor boundary.

10. Locate on the floor plan the area to be covered by each piece of furniture or architectural feature.

A3. Handout for Day Two- Directions for One-Point Perspective (1 of 2)

11. Locate the floor plan intersections of each piece of furniture and architectural feature in perspective. (From this point on it is useful to use overlays of sketch paper to plot individual objects.)

12. Using an overlay sheet, trace the floor plan of each piece of furniture again and project vertical lines a short distance from the floor. Use the true measure from the picture plane to project the objects height onto the closest side wall. Project a horizontal line on the floor from the object to the wall, and then project a vertical line up to the intersection of the height line. From this intersection, project a line parallel to the floor line back to the object.

13. Individual colored ink or pencil lines will help to separate all of the overlapping pieces.

14. After all pieces have been drawn, a final overlay will be needed onto which one should trace only those portions visible to the viewer.

A3.1 Handout for Day Two- Directions for One-Point Perspective (2 of 2)

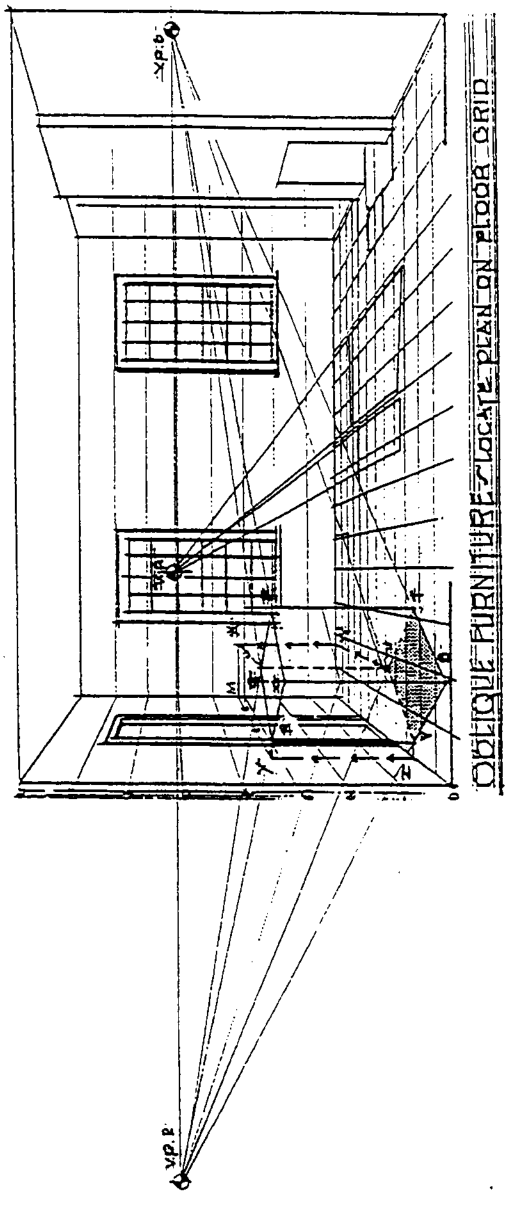
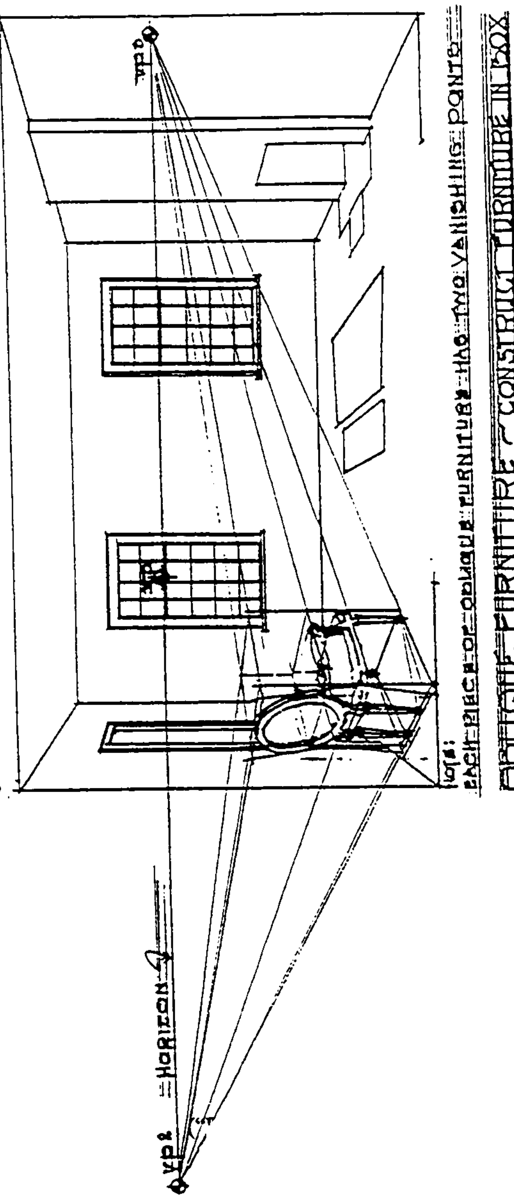


FIGURE 5-17

Leach, Sid DelMar (1978). Techniques in Interior Design Rendering and Presentation. New York: MacGraw-Hill.

A4. Handout for Day Three- Oblique Handout (1 of 3)

FIGURE 5-18



Leach, Sid DelMar (1978). <u>Techniques in Interior Design Rendering and Presentation.</u> New York: MacGraw-Hill.

A4.1 Handout for Day Three- Oblique Handout (2 of 3)

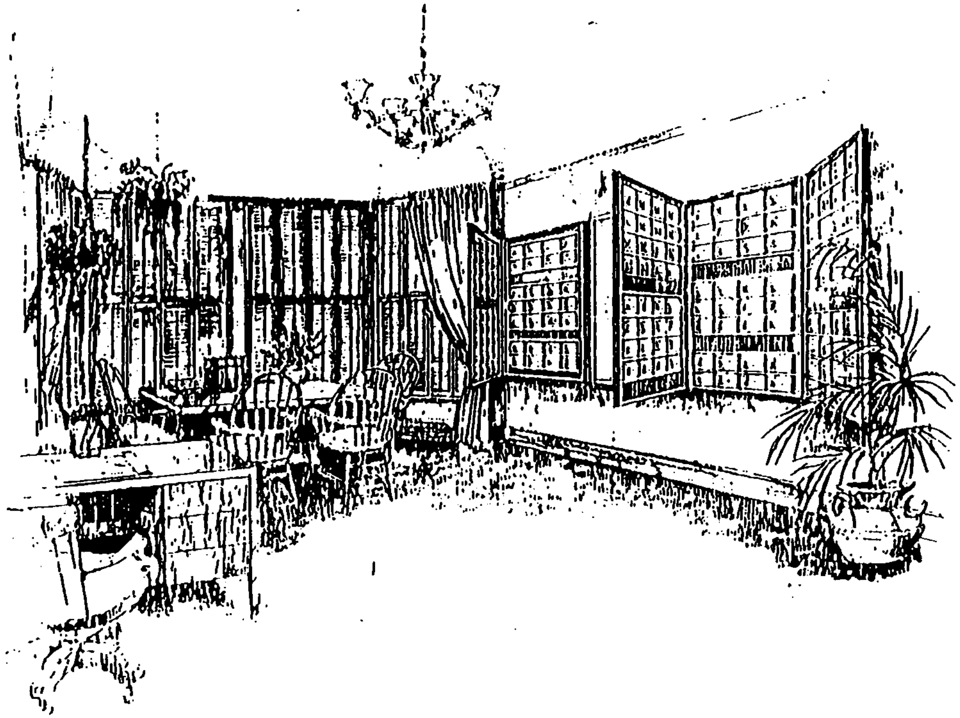


FIGURE 5-20: This pencil rendering of a real estate sales-conference room will be used as the basis for the final perspective project, in this chapter. The student should retain the finished under-drawing for use in Chapters 6, "Value Study of Shade and Shadow," and 10, "Pencil Rendering."

In one-point perspective (Figure 5-17) if a piece of furniture is at an oblique angle to the room perimeter walls, this piece will have its own set of two vanishing points, each on the horizon line. After plotting the plan (shaded area), the perimeter heights of each box are plotted in the same manner as was discussed previously with reference to Figure 5-8a. (Note: with relation to two-point perspective, if a piece of furniture is at an oblique angle to either perimeter wall, it will have its own vanishing point or set of two vanishing points.)

Figure 5-18 and Figure 5-19 carry this exercise through to conclusion and each step should be studied carefully. It would be well to note here that many times one must "fake" position of an oblique object in order to make it read properly and not appear as though it were falling out of the picture. This "artistic license" is sometimes necessary and should not be overlooked.

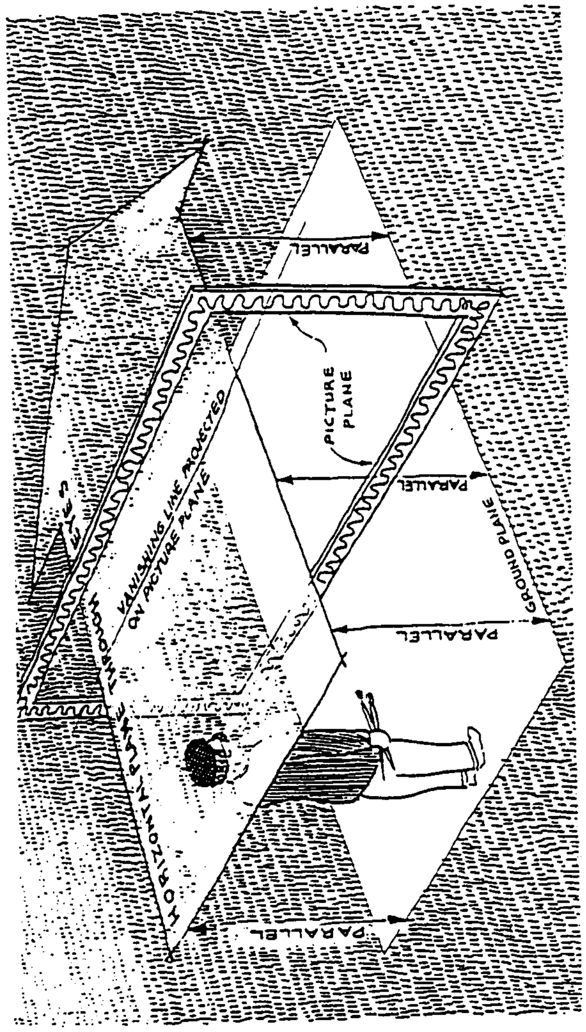
Leach, Sid DelMar (1978). Techniques in Interior Design Rendering and Presentation. New York: MacGraw-Hill.

A4.2 Handout for Day Three- Oblique Handout (3 of 3)

APPENDIX B

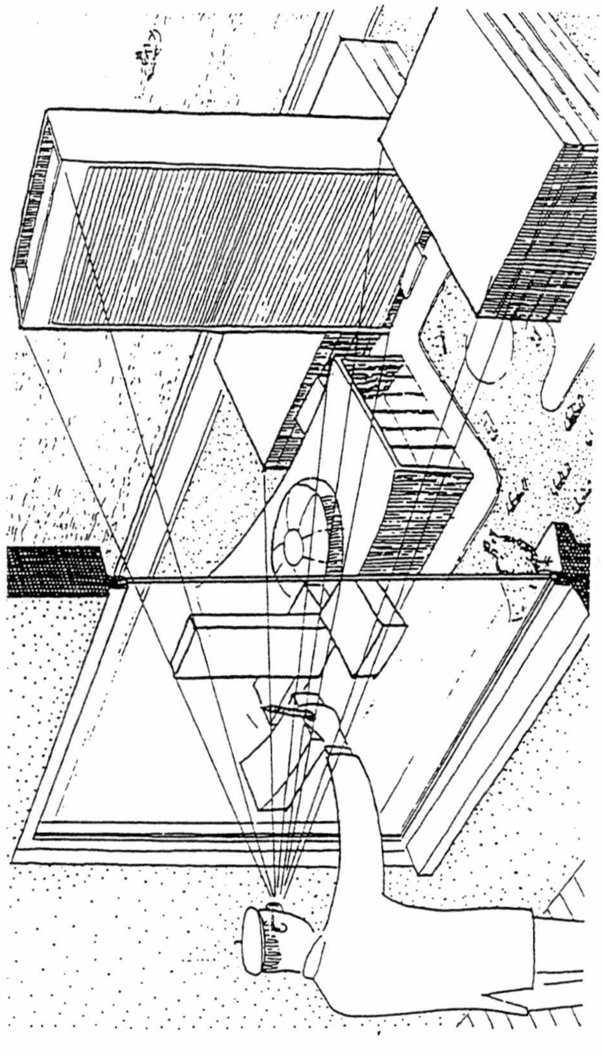
OVERHEADS

CONTENTS- APPENDIX B



D'Amelio, Joseph (1964). Perspective Drawing Handbook: Fundamentals of Perspective Drawing Clearly Explained by Joseph D'Amelio. New York: Van Nostrand Reinhold.

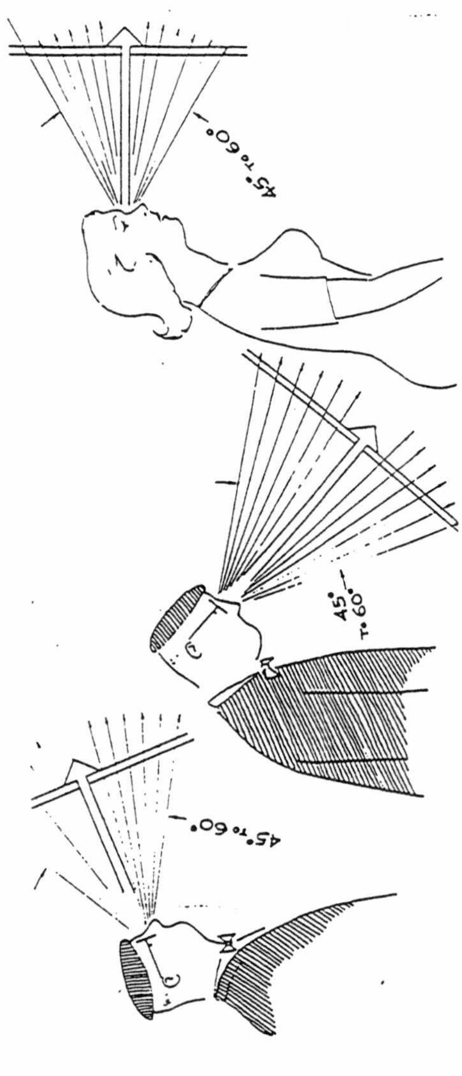
B1. Overhead Day One- Fundamentals of Perspective



Basis Of Perspective — Lines Of Sight Through A Picture Plane

D'Amelio, Joseph (1964). Perspective Drawing Handbook: Fundamentals of Perspective Drawing Clearly Explained by Joseph D'Amelio. New York: Van Nostrand Reinhold.

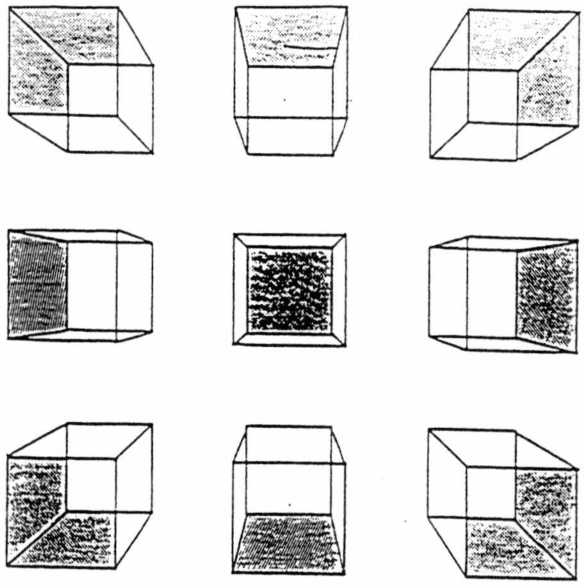
B1.1 Overhead Day One- Lines of Sight



To understand perspective drawing a PICTURE PLANE must be imagined between the observer and subject.
THIS PLANE HAS A CONSTANT RIGHT ANGLE RELATIONSHIP WITH THE CENTRAL VISUAL RAY.

D'Amelio, Joseph (1964). <u>Perspective Drawing Handbook: Fundamentals of Perspective Drawing Clearly Explained by Joseph D'Amelio.</u> New York: Van Nostrand Reinhold.

B1.2 Overhead Day One- Picture Plane

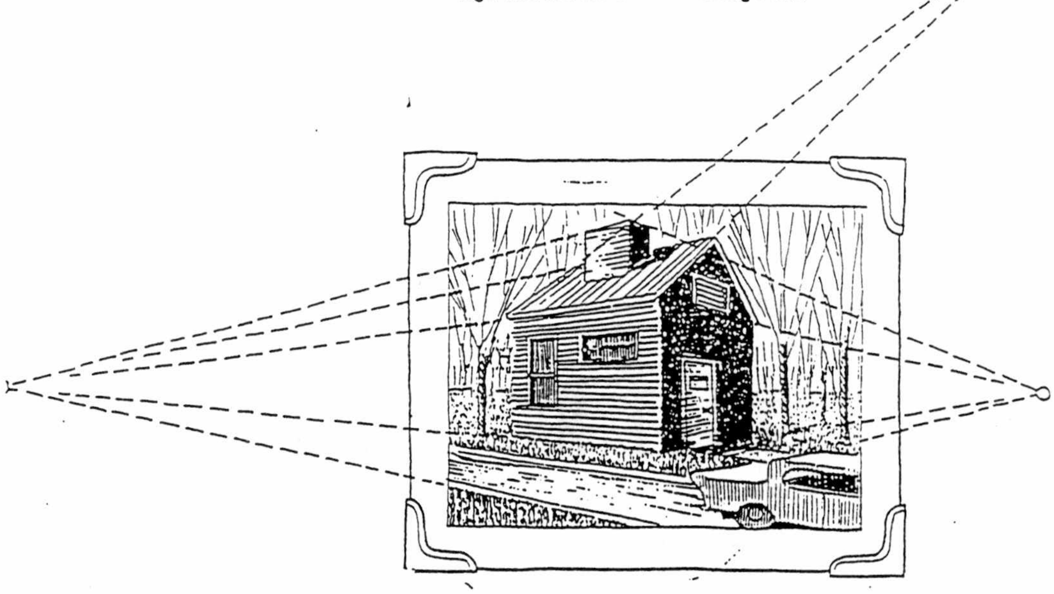


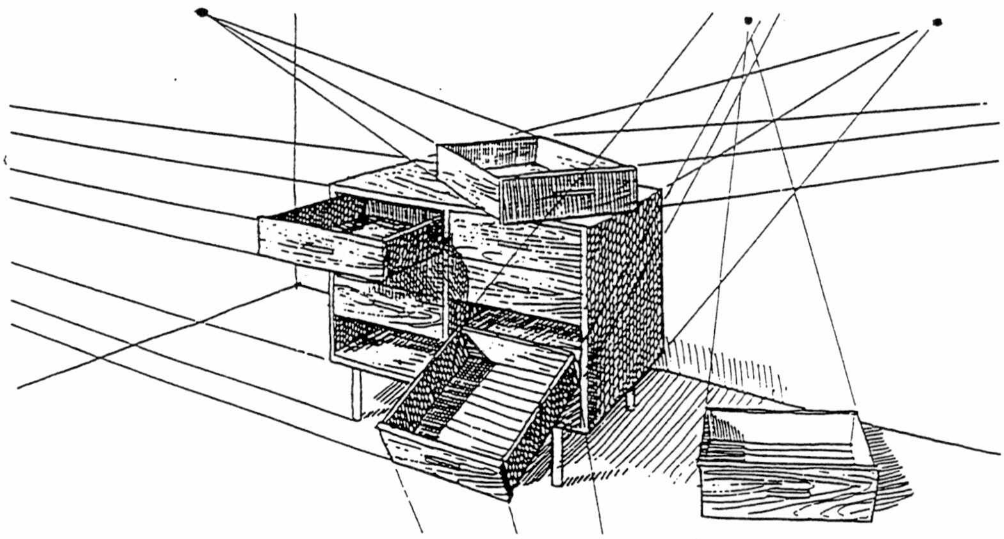
In a one-point perspective, the vanishing point is on a line that is perpendicular to the picture plane and intersects the observer's eyes (station point). Visualizing and drawing a cube anywhere in space in any orientation and noting the emphasis on different planes as the cube moves around will enhance your perspective drawing skills.

D'Amelio, Joseph (1964). Perspective Drawing Handbook: Fundamentals of Perspective Drawing Clearly Explained by Joseph D'Amelio. New York: Van Nostrand Reinhold.

B1.3 Overhead Day One- One Point Perspective

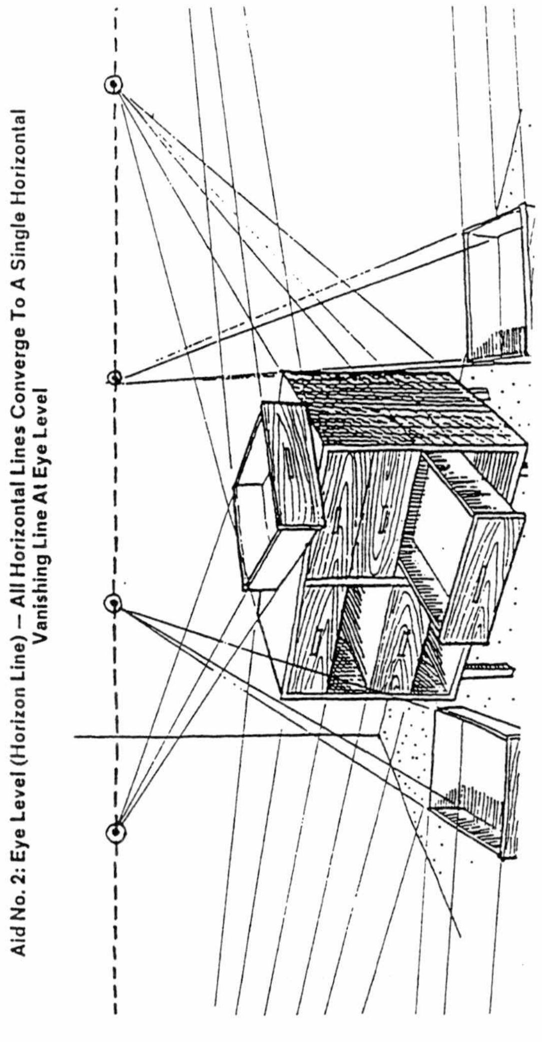
[24] Vanishing Points (Cont.)—When There Are Many Sets Of Parallel Lines Going In Different Directions, Each Will Converge Toward Its Own Vanishing Point





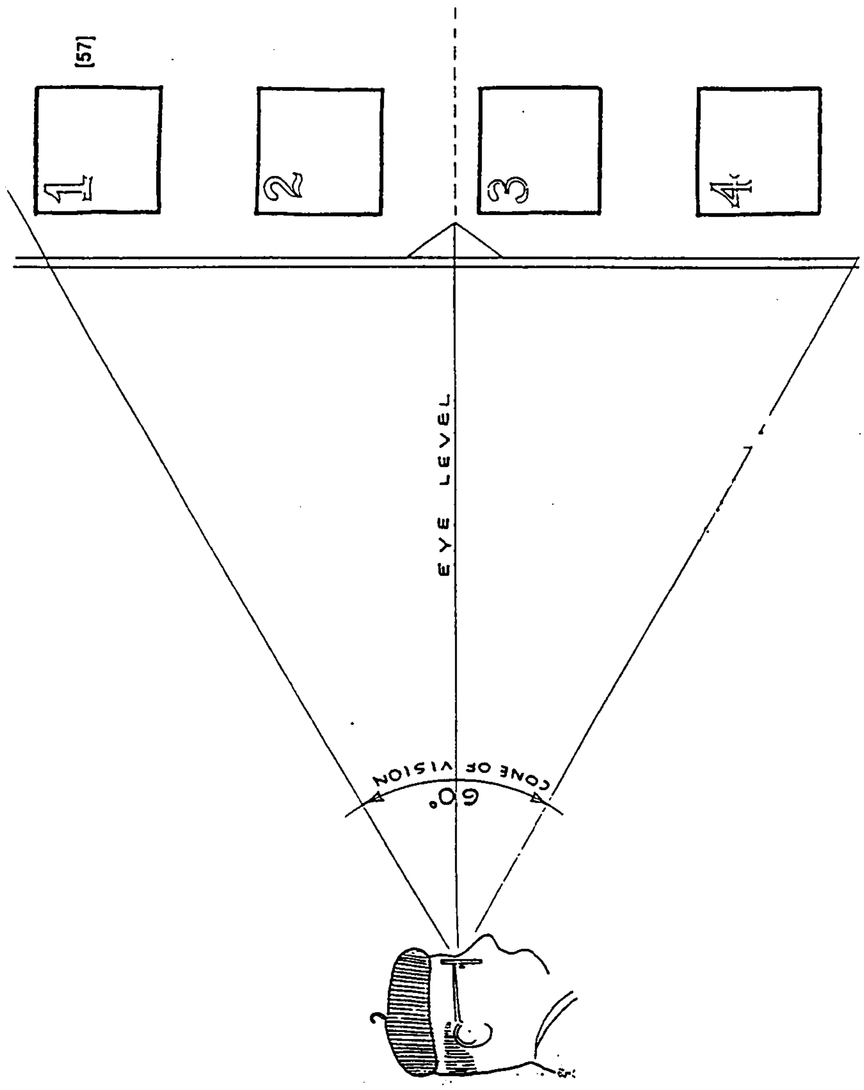
D'Amelio, Joseph (1964). Perspective Drawing Handbook: Fundamentals of Perspective Drawing Clearly Explained by Joseph D'Amelio. New York: Van Nostrand Reinhold.

B1.4 Overhead Day One- Vanishing Points



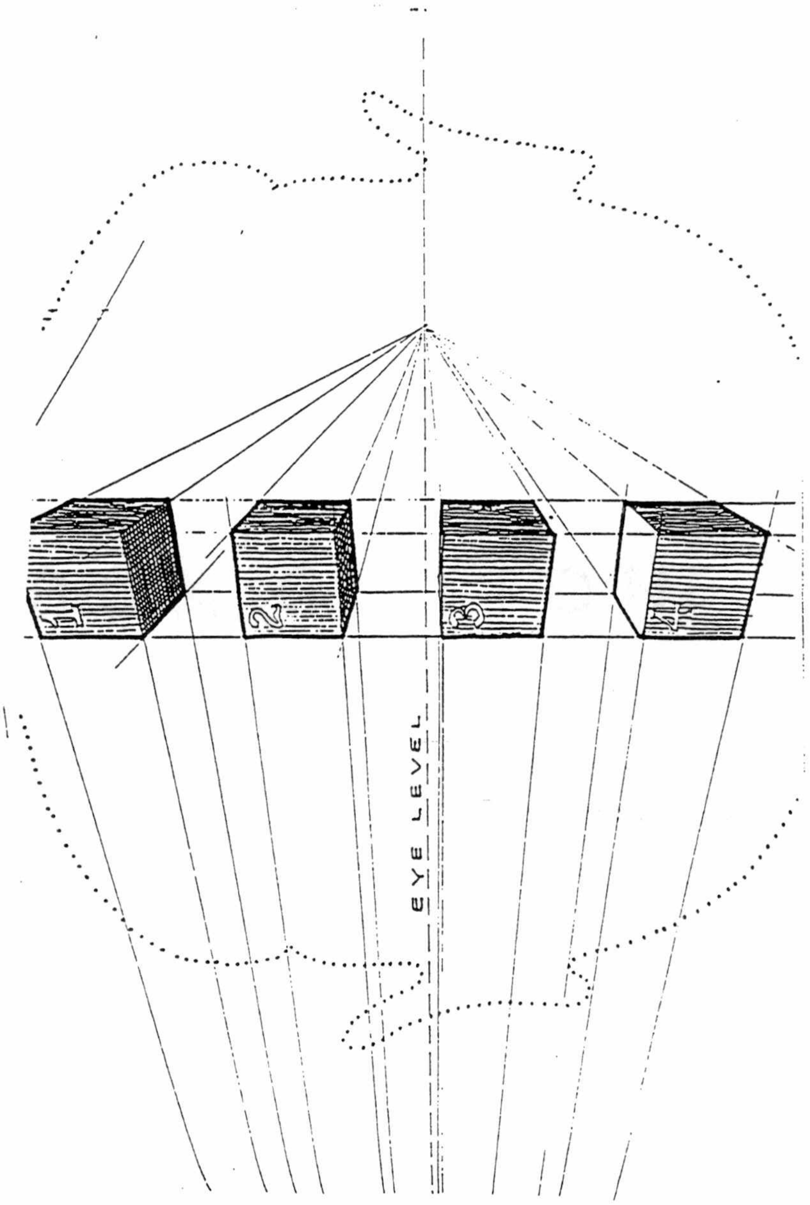
D'Amelio, Joseph (1964). Perspective Drawing Handbook: Fundamentals of Perspective Drawing Clearly Explained by Joseph D'Amelio. New York: Van Nostrand Reinhold.

B1.5 Overhead Day One- Horizon Line



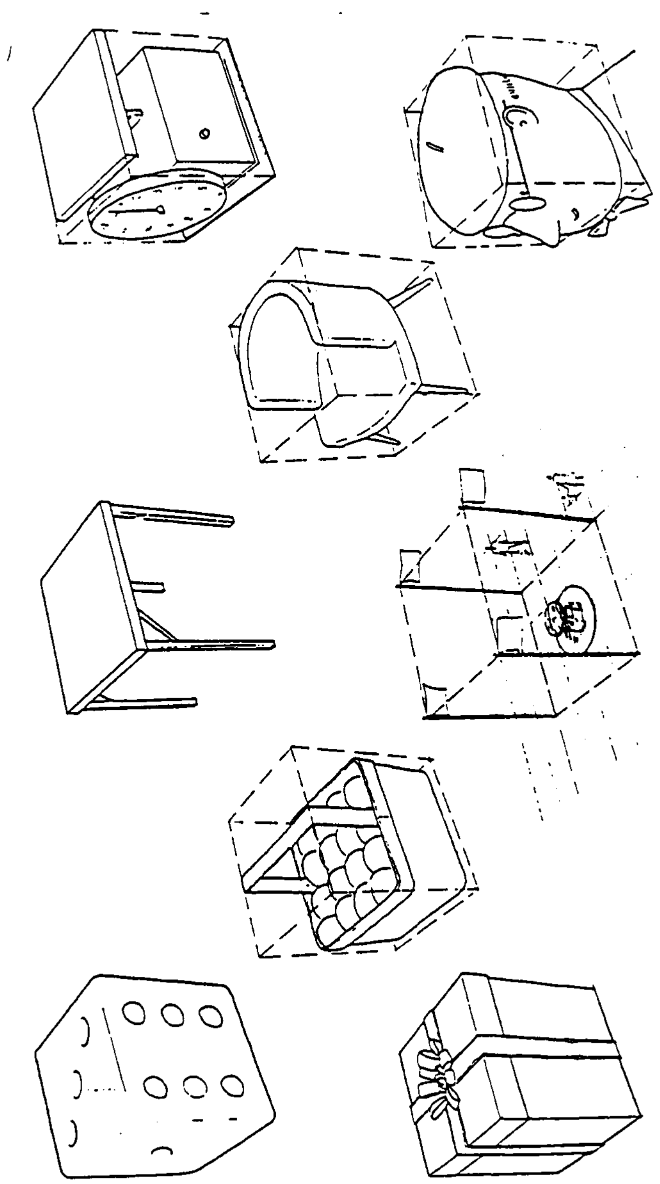
D'Amelio, Joseph (1964). Perspective Drawing Handbook: Fundamentals of Perspective Drawing Clearly Explained by Joseph D'Amelio. New York: Van Nostrand Reinhold.

B1.6 Overhead Day One- Cone of Vision



D'Amelio, Joseph (1964). Perspective Drawing Handbook: Fundamentals of Perspective Drawing Clearly Explained by Joseph D'Amelio. New York: Van Nostrand Reinhold.

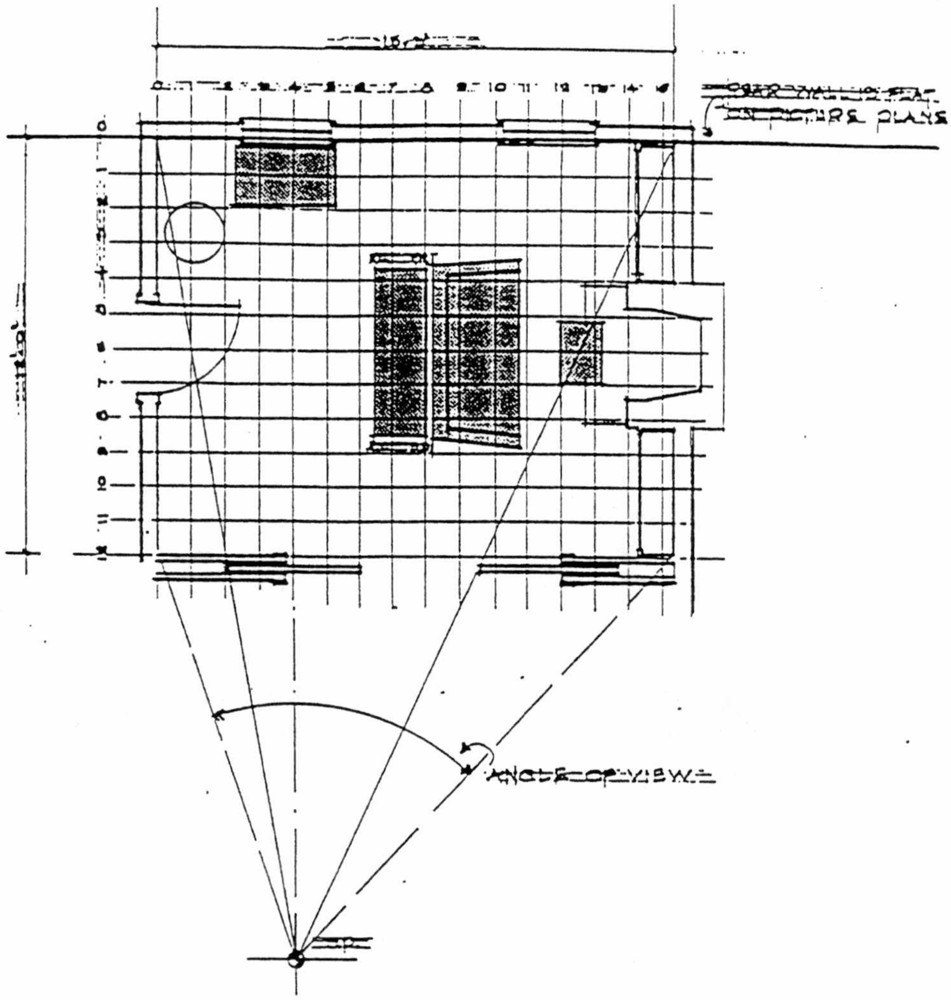
B1.7 Overhead Day One- Eye Level



The Basic Cube Can Become The Basis For An Endless Variety Of Objects

D'Amelio, Joseph (1964). Perspective Drawing Handbook: Fundamentals of Perspective Drawing Clearly Explained by Joseph D'Amelio. New York: Van Nostrand Reinhold.

B2. Overhead Day Two- The Basic Cube

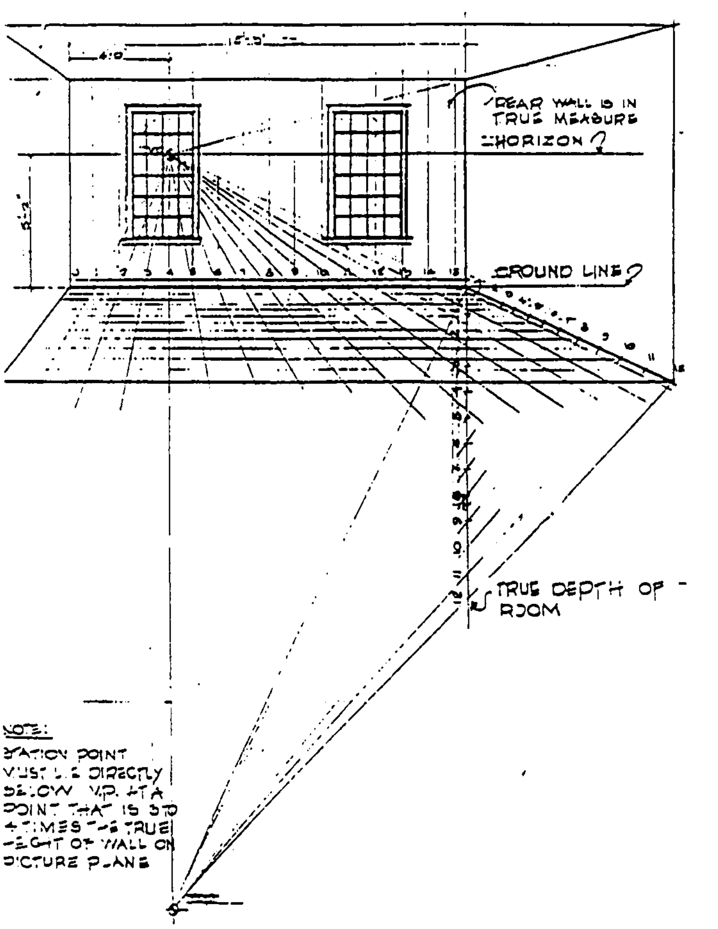


PLAN WITH GRID OVERLAY

FIGURE 5-5: In one-point perspective of an interior, the floor plan lies in front of the picture plane with the rear wall of the room flat on the picture plane.

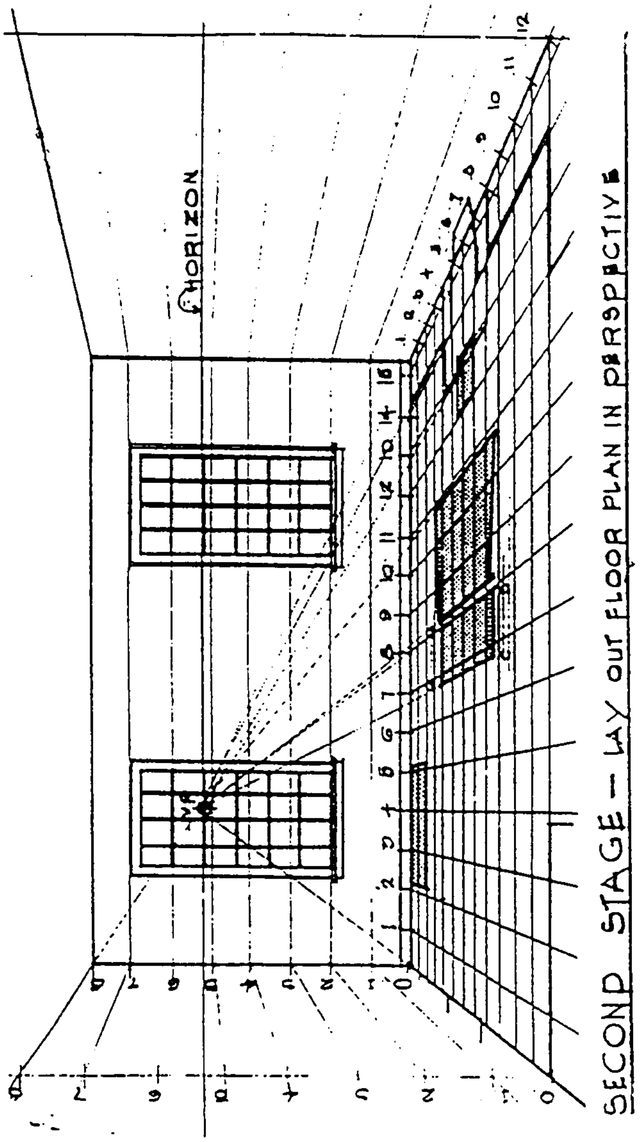
Leach, Sid DelMar (1978). Techniques in Interior Design Rendering and Presentation. New York: MacGraw-Hill.

B2.1 Overhead Day Two- Office Plan Method (1 of 4)



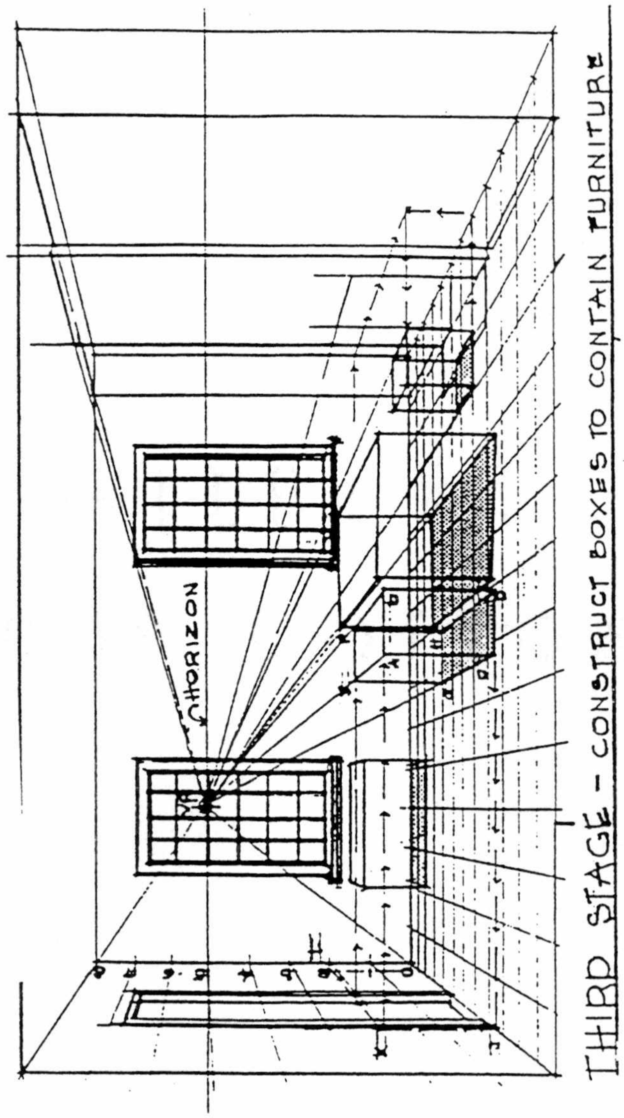
Leach, Sid DelMar (1978). Techniques in Interior Design Rendering and Presentation. New York: MacGraw-Hill.

B2.2 Overhead Day Two- Office Plan Method (2 of 4)



Leach, Sid DelMar (1978). Techniques in Interior Design Rendering and Presentation. New York: MacGraw-Hill.

B2.3 Overhead Day Two- Office Plan Method (3 of 4)



Leach, Sid DelMar (1978). <u>Techniques in Interior Design Rendering and Presentation.</u>
New York: MacGraw-Hill.

B2.4 Overhead Day Two- Office Plan Method (4 of 4)

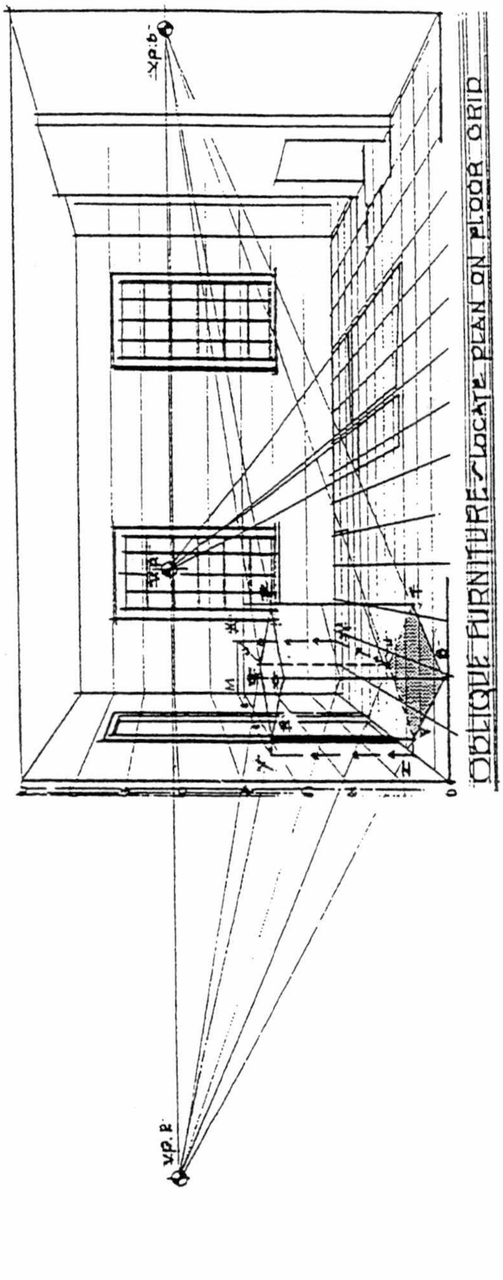
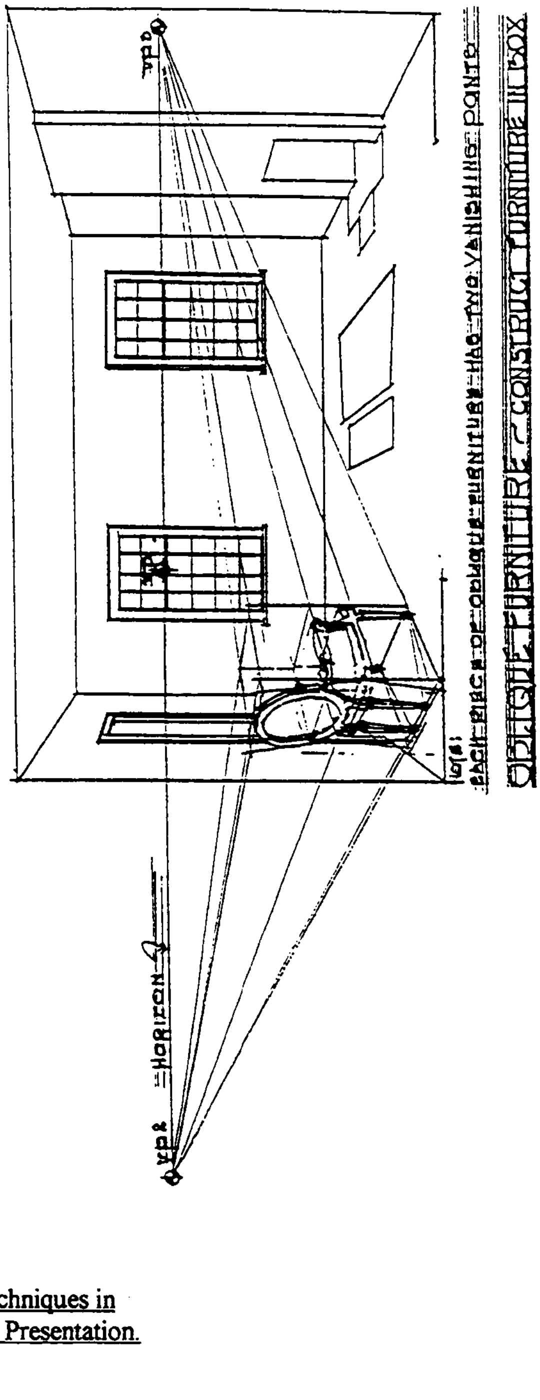


FIGURE 5-17

Leach, Sid DelMar (1978). Techniques in Interior Design Rendering and Presentation. New York: MacGraw-Hill.

B3. Overhead Day Three- Oblique Objects (1 of 2)

FIGURE 5-18



Leach, Sid DelMar (1978). <u>Techniques in Interior Design Rendering and Presentation.</u>
New York: MacGraw-Hill.

B3.1 Overhead Day Three- Oblique Objects (2 of 2)

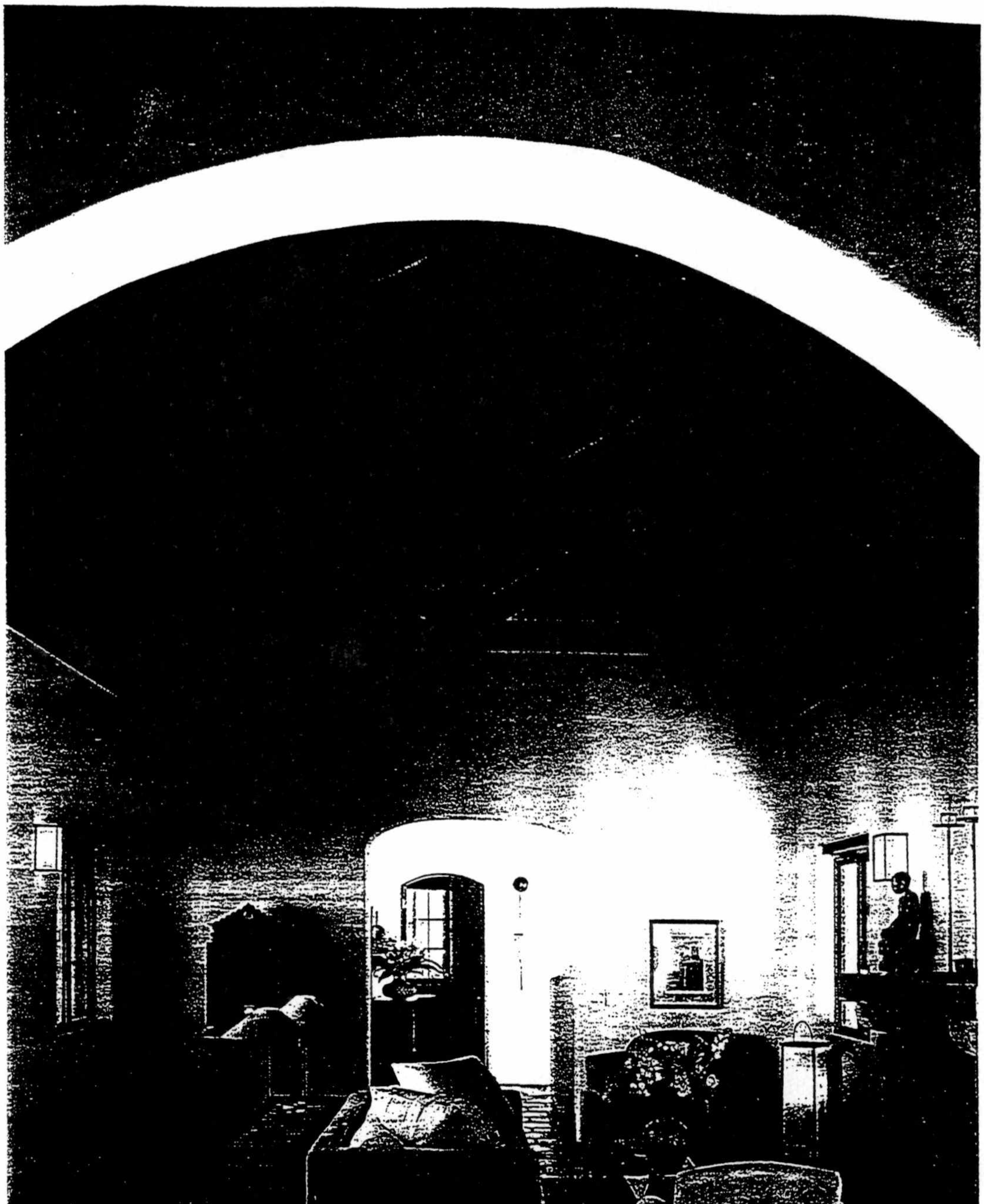
APPENDIX C

EXERCISES

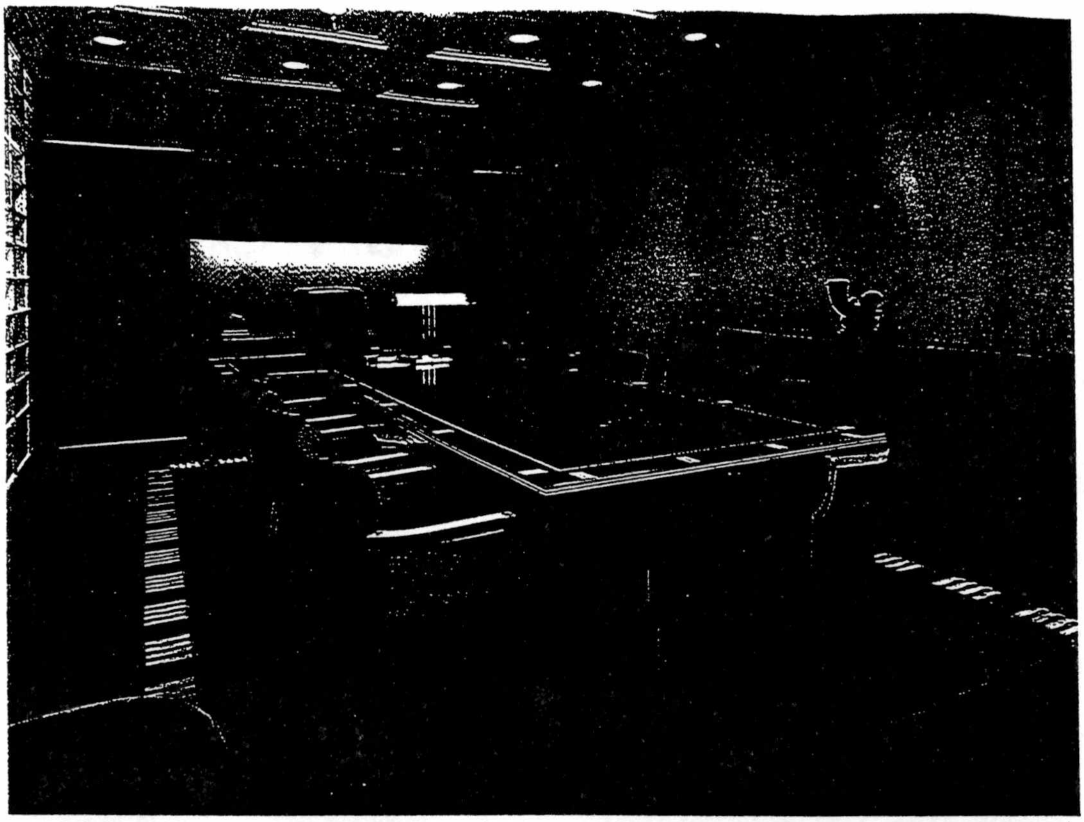
CONTENTS- APPENDIX C

The students were verbally instructed to use the magazine photographs simulating one-point perspectives (appendices C1.1-C1.4) to practice identifying elements of perspective drawing. The students were instructed to use a tracing paper overlay to trace the elements. The elements included: picture plane, ground plane, ground line, vanishing point, horizon line, etc. The students were also asked to identify if the station point would be located to the right, left, or center of the picture. The students were also asked to identify the "imposter" perspective which is a two-point perspective.

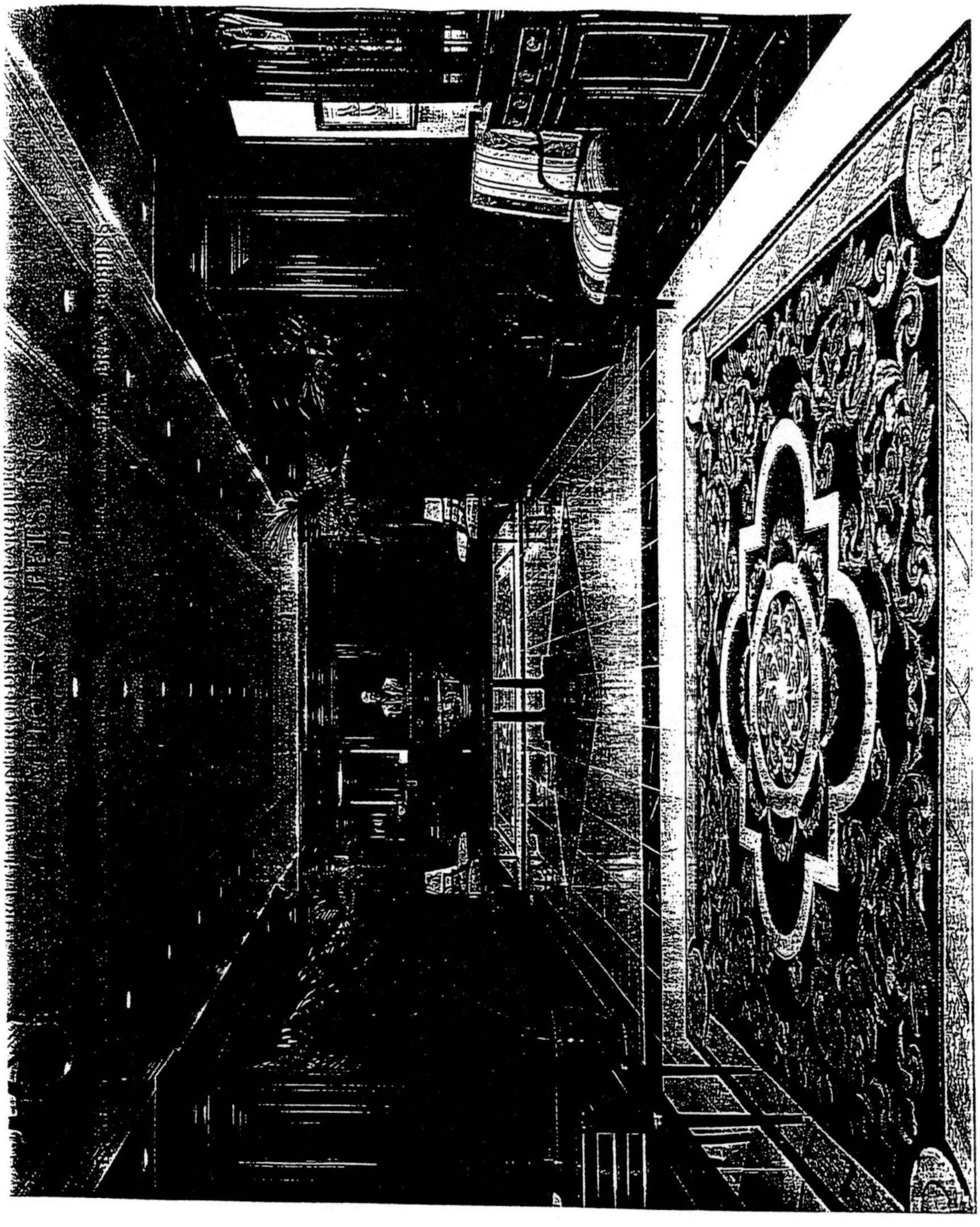
C1. Day One Instructions for In-Class Exercises



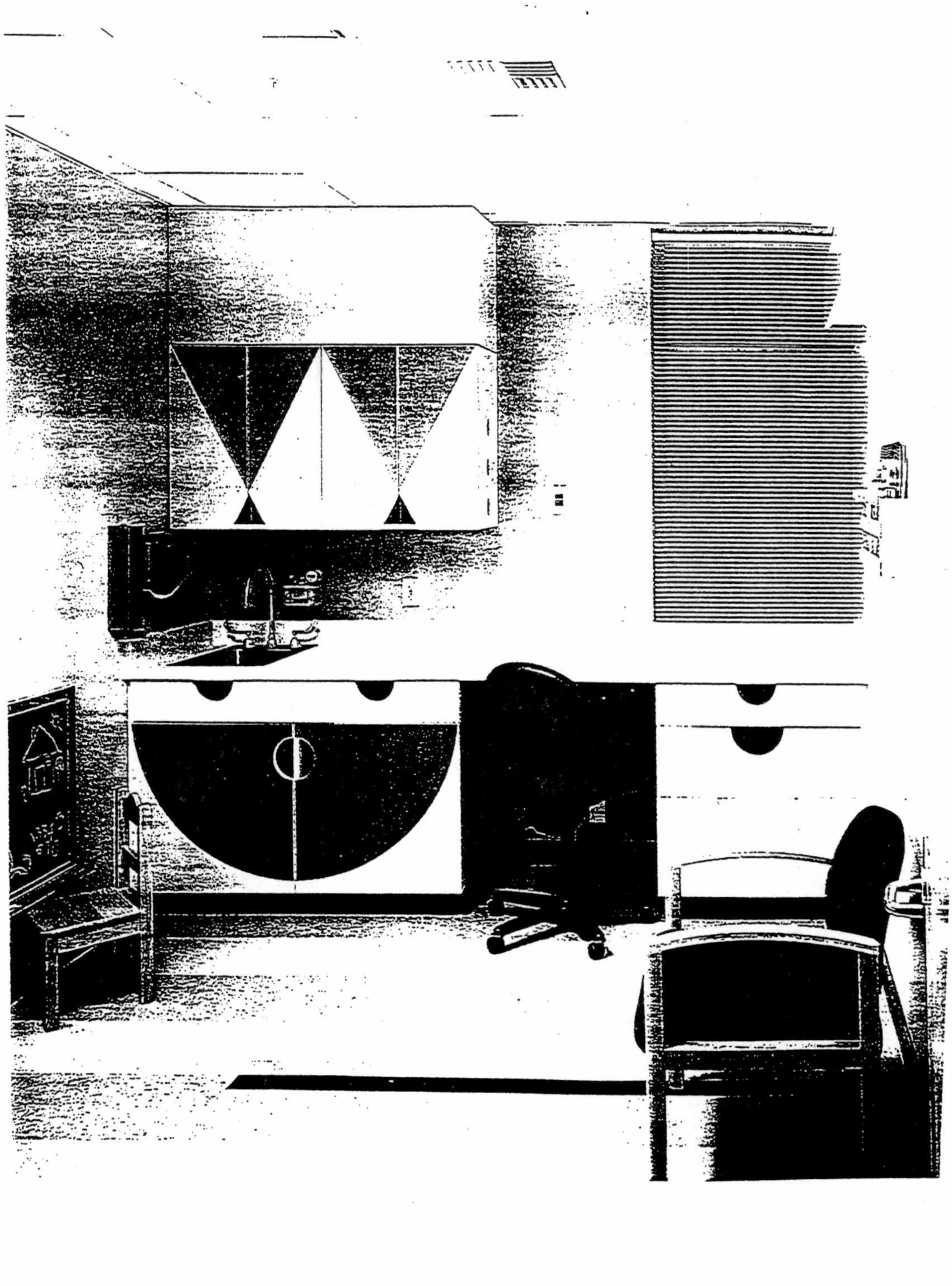
C1.1 Day One In-Class Exercise (1 of 4)



C1.2 Day One In-Class Exercise (2 of 4)



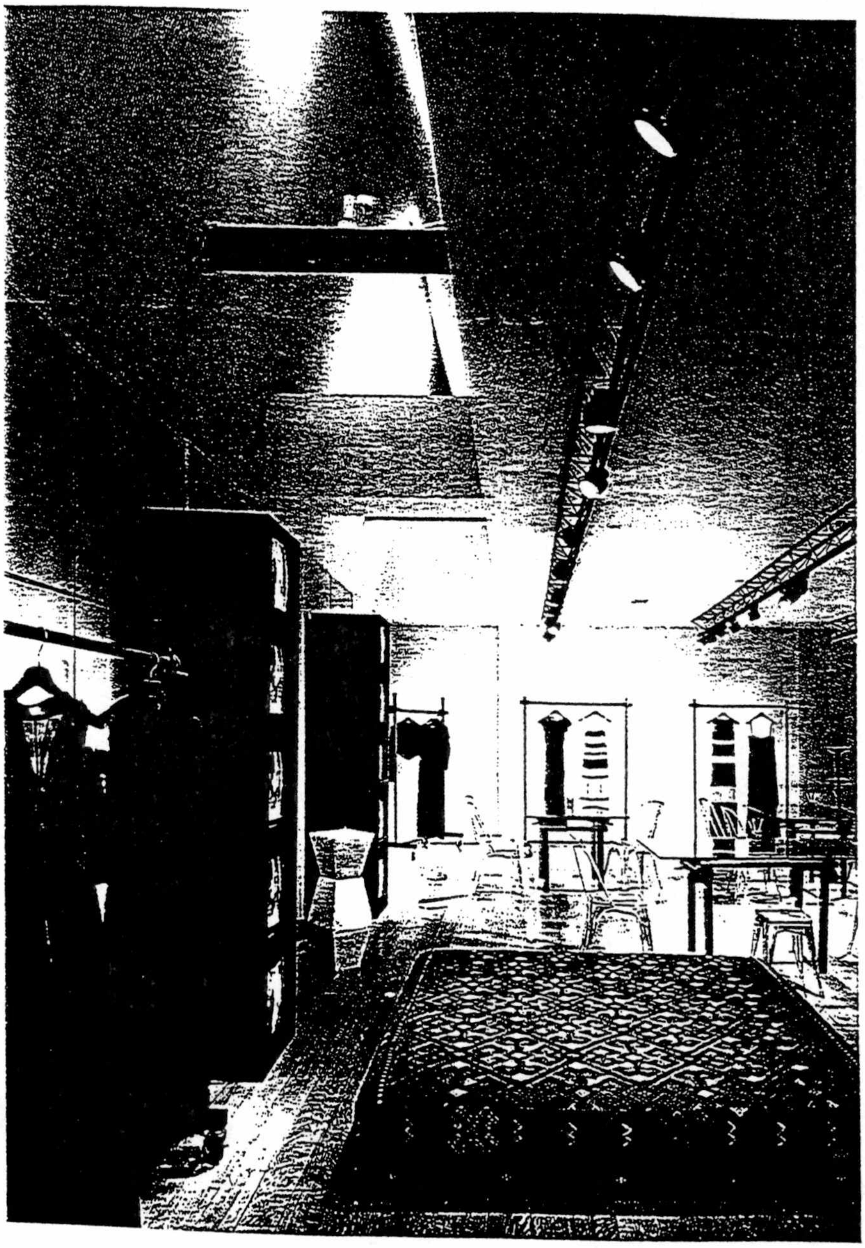
C1.3 Day One In-Class Exercise (3 of 4)



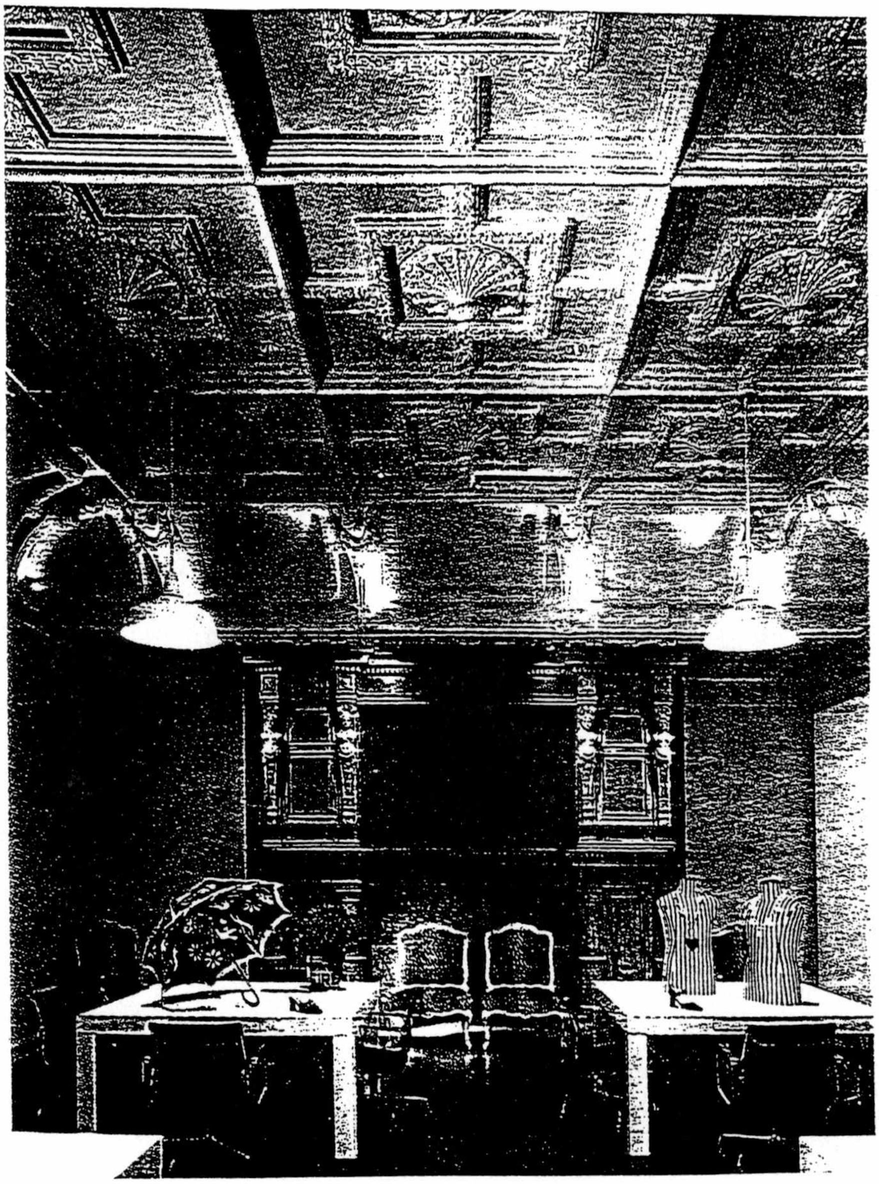
C1.4 Day One In-Class Exercise (4 of 4)

The students were verbally instructed to use computer drawn perspectives and magazine photographs simulating one-point perspectives (appendices C2.1-C2.4) to practice identifying elements of perspective drawing. The students were instructed to use a tracing paper overlay to trace the elements. The elements included: picture plane, ground plane, ground line, vanishing point, horizon line, etc. The students were also asked to identify if the station point would be located to the right, left, or center of the picture.

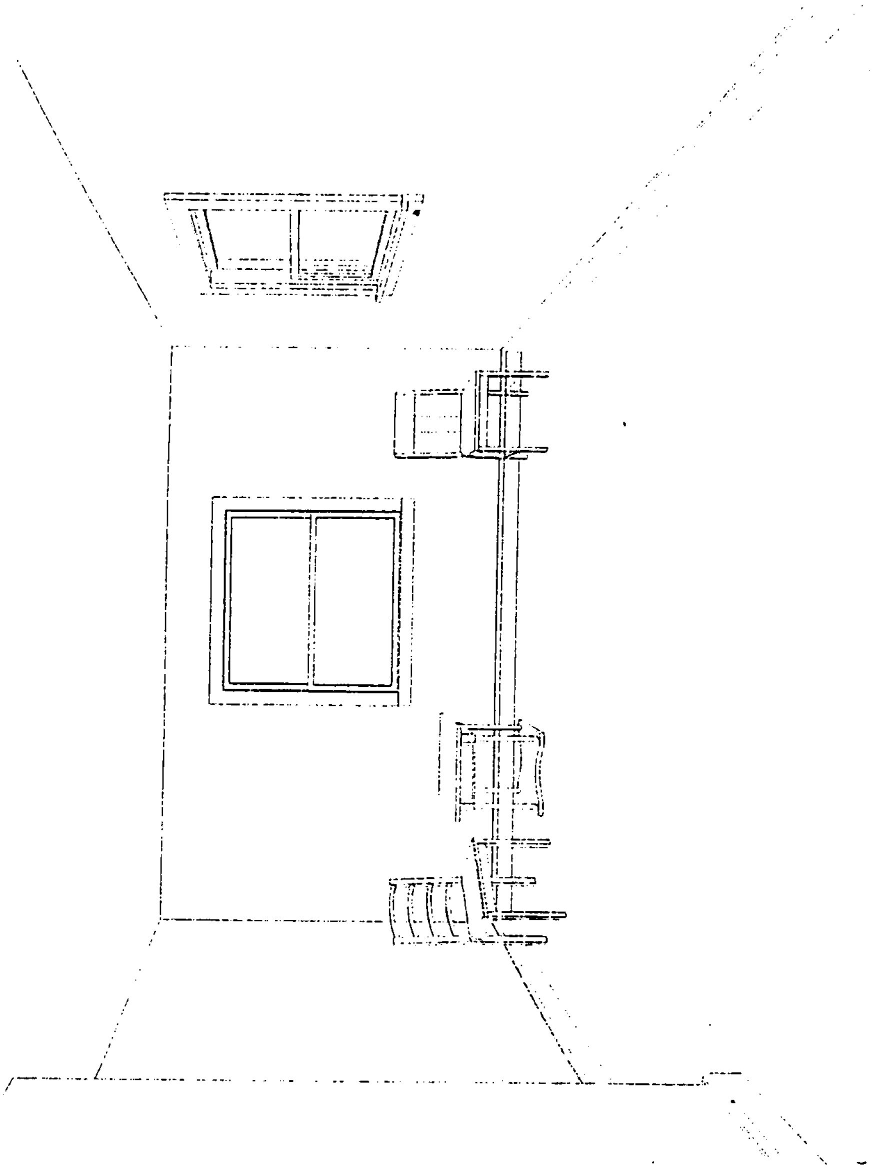
C2. Day One Instructions for Homework Exercises



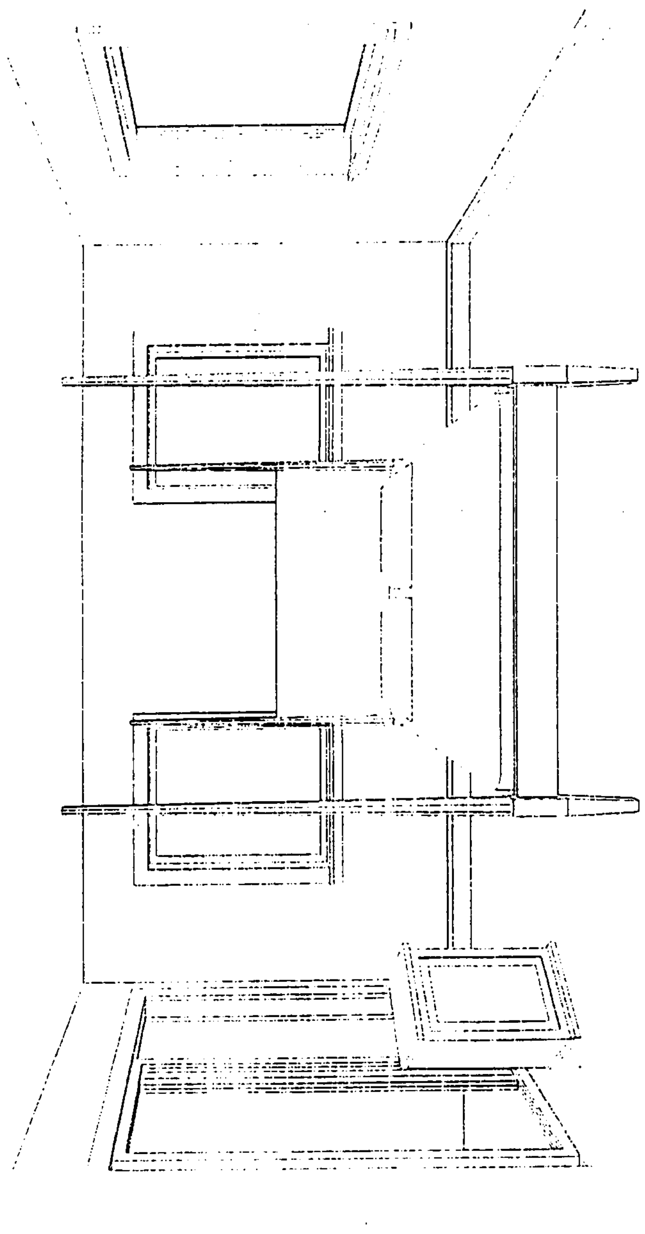
C2.1 Day One Homework Exercise (1 of 4)



C2.2 Day One Homework Exercise (2 of 4)



C2.3 Day One Homework Exercise (3 of 4)

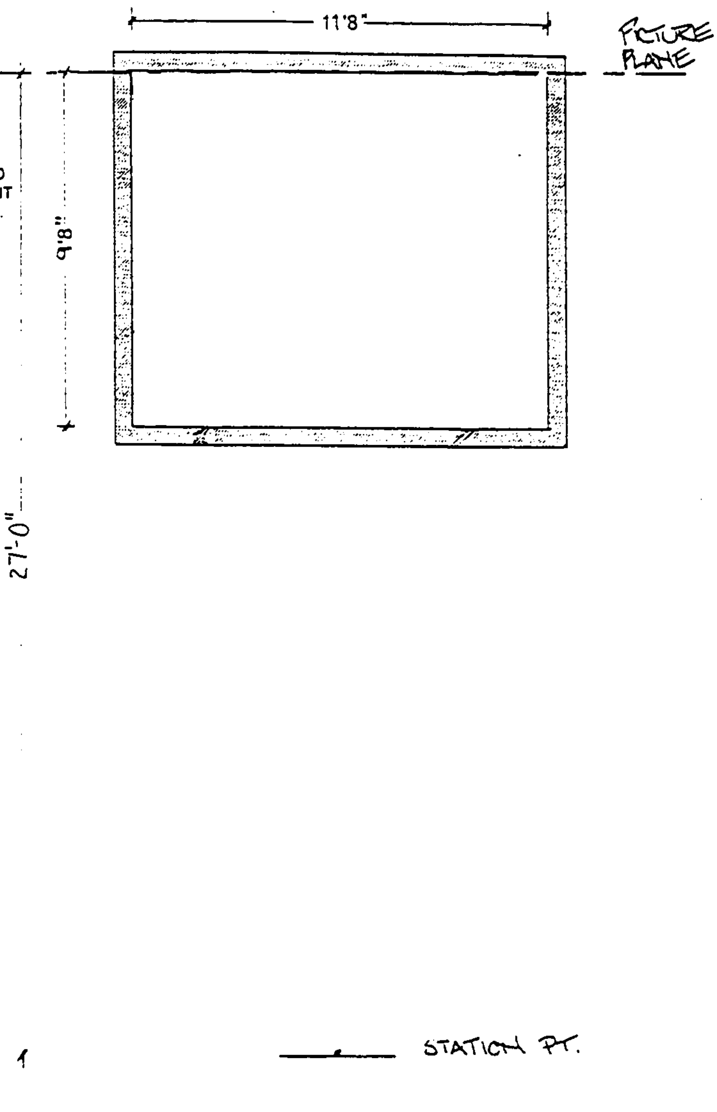


C2.4 Day One Homework Exercise (4 of 4)

HOMEWORK DAY 2

scale: 1/4"=1'-0"
9' ceilings
wall thickness 6"

USE THIS FLOORPLAN TO CONSTRUCT A ONE-POINT PERSPECTIVE DRAWING.



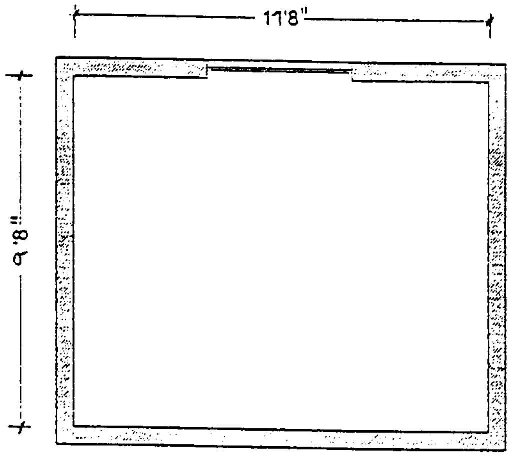
C3. Day Two Homework Exercise (1 of 2)

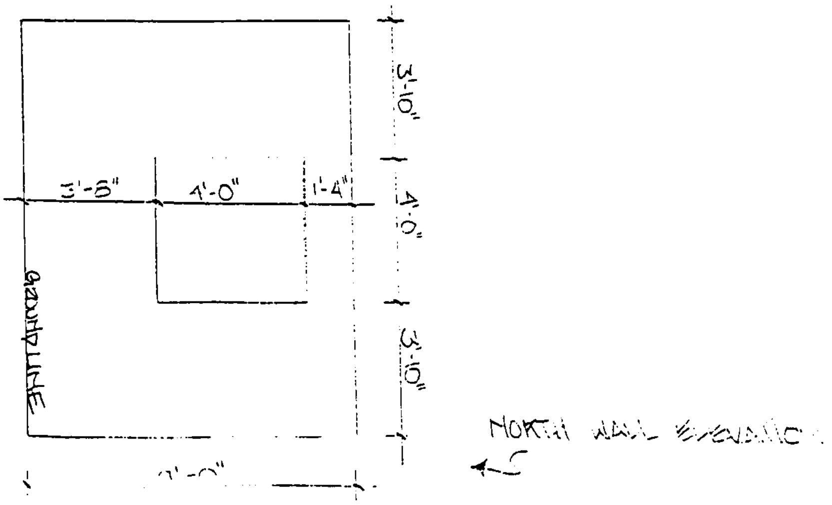
HOMEWORK DAY 2

scale: 1/4"=1'-0"
9' ceilings
wall thickness 6"

USING THE PERSPECTIVE CONSTRUCTED FOR THE HOMEWORK ASSIGNMENT , LOCATE AND CONSTRUCT A WINDOW.

WINDOW SPECIFICATIONS:
4'-0" x 4'-0"
Centered on North Wall
7'-8" from top of wdo to floor





C3.1 Day Two Homework Exercise (2 of 2)

HOMEWORK DAY 3

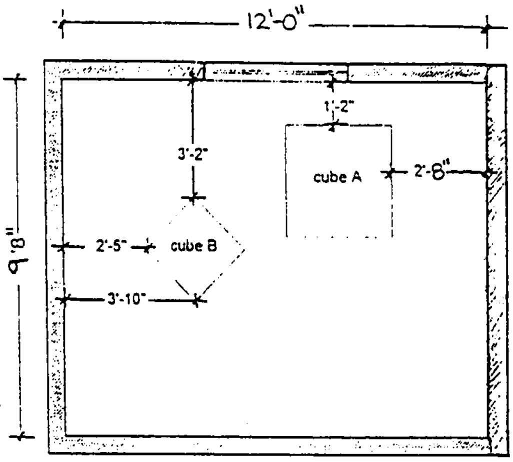
scale: 1/4"=1'-0"
9' ceilings
wall thickness 6"

USING THE PERSPECTIVE CONSTRUCTED FOR THE HOMEWORK ASSIGNMENT (DAY 3), PLACE A CUBE ACCORDING TO SPECIFICATIONS.

CUBE SPECIFICATIONS:

CUBE A:
CONSTRUCT A 3'X3'X3' CUBE IN THE LOCATION INDICATED ON THE FLOOR PLAN.

CUBE B:
CONSTRUCT A 2'X2'X2' CUBE AT A 45 DEGREE ANGLE IN THE LOCATION INDICATED ON THE FLOOR PLAN.



C4. Day Three Homework Exercise

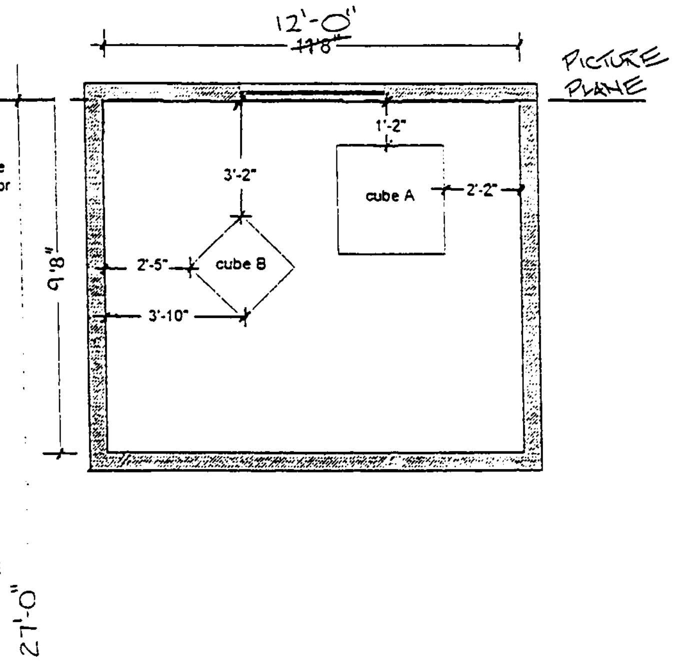
IN-CLASS EXERCISES
DAY 4
USING THE SAME INSTRUCTIONS FROM THE DAY 3 HOMEWORK, DRAW A ONE POINT PERSPECTIVE USING A DIFFERENT STATION POINT. (the new station point is indicated on floor plan)
scale: 1/4"=1'-0"
9' ceilings
wall thickness 6"

USING THE PERSPECTIVE CONSTRUCTED FOR THE HOMEWORK ASSIGNMENT (DAY 3), PLACE A CUBE ACCORDING TO SPECIFICATIONS.

CUBE SPECIFICATIONS:

CUBE A:
CONSTRUCT A 3'X3'X3' CUBE IN THE LOCATION INDICATED ON THE FLOOR PLAN.

CUBE B:
CONSTRUCT A 2'X2'X2' CUBE AT A 45 DEGREE ANGLE IN THE LOCATION INDICATED ON THE FLOOR PLAN.



Station Point is located:
3'-6" from right interior wall
27'-0" from back interior wall

STATION PT

C5. Day Four In-Class Exercise

APPENDIX D

PRE-TEST, EXPERIMENTAL TREATMENT, AND POST-TEST

CONTENTS- APPENDIX D

* USE ½" SCALE

PRE-TEST EXERCISE
THIS EXERCISE IS TO BE COMPLETED AT HOME AND HANDED IN AT THE BEGINNING OF THE NEXT CLASS MEETING.

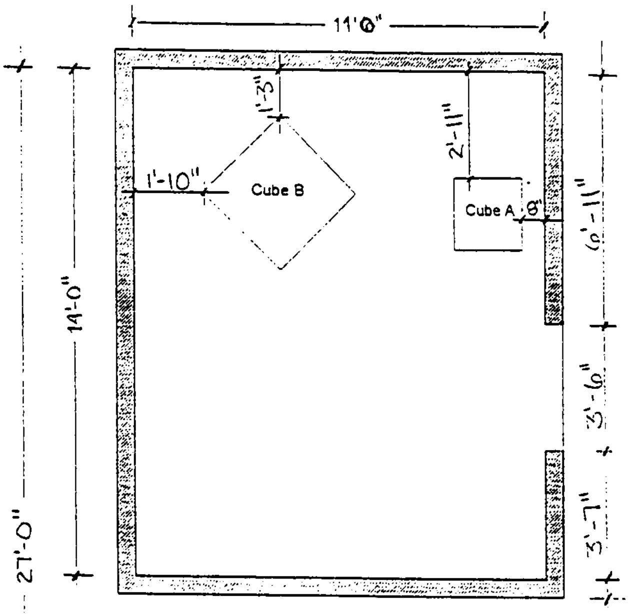
Please complete the following steps IN ORDER:
Scale: 1/4"= 1'-0"
9' ceiling
wall thickness 6"

1. Construct the walls in a one pt. perspective according to instructions.

2. Locate and construct a door opening.
OPENING SPECIFICATIONS:
3'-6" x 6'-6"
Place on right wall.

3. Cube A: Construct a 2'x2'x2' cube in the location indicated on the floor plan.

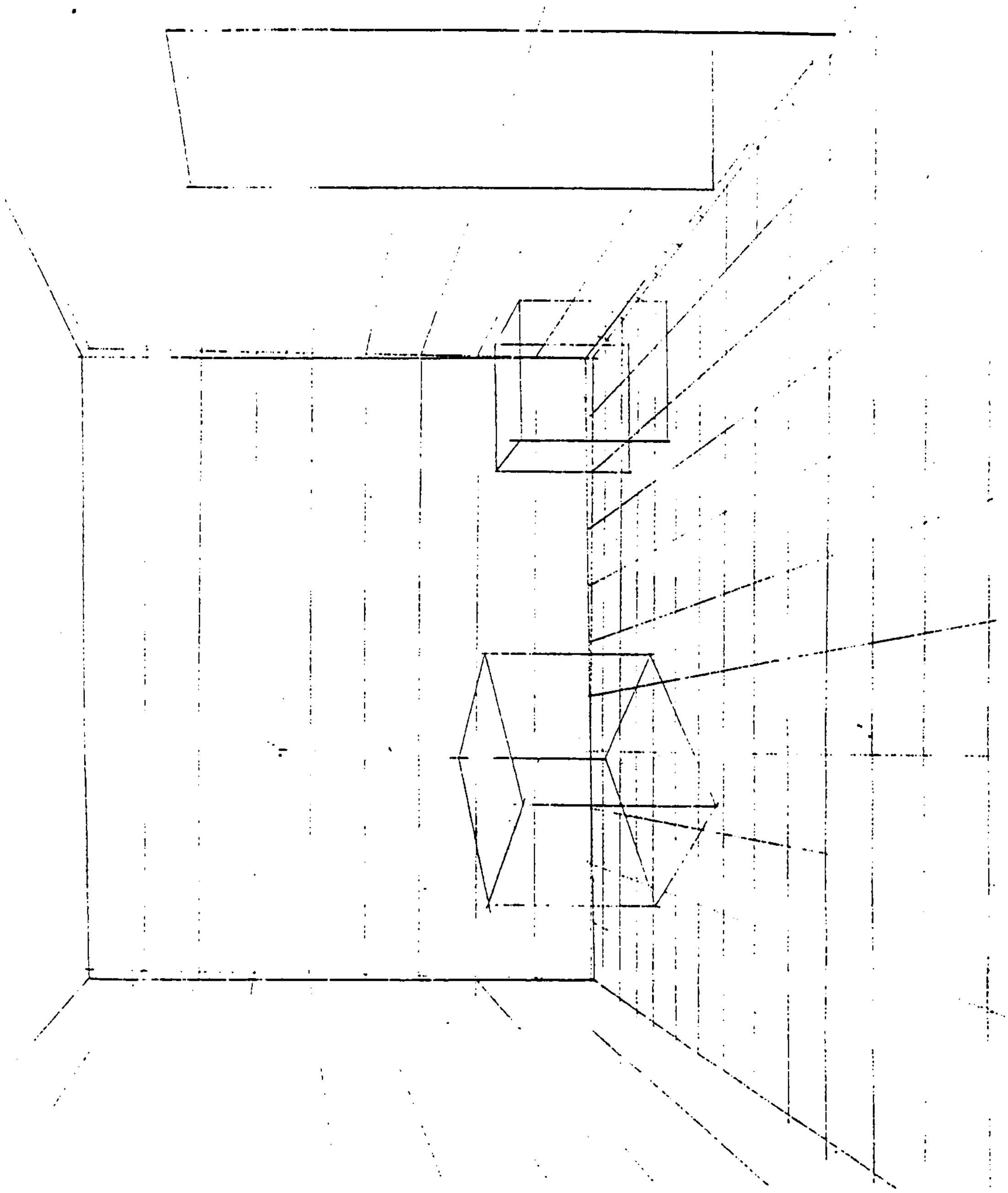
4. Cube B: Construct a 3'x3'x3' cube at a 45 degree angle in the location indicated on the floor plan.



Station Point is located:
4'-0" from left interior wall
27'-0" from back interior wall

STATION PT

D1. Pre-Test Instructions



D2. Completed Pre-Test Drawing

SCALE MODEL PROJECT GUIDELINES

A. Construction

1. Create the floor (A.) of the scale model using 1/8" foam core board.
   Dimensions: 15'-0" wide by 10'-6" deep (***add1/8" to rt., lft., and back sides for construction overlap---i.e. **15'-3" x 10'-7 ½"*****)
   Scale 1"=1'-0"

2. Construct one 15'-0 wall (B.) with a 9' ceiling. (***remember to add 2x 1/8" to width for construction overlap--- i.e. **15'-3" x 9'-0"*****)

3. Construct two 10'-6" walls (C.) with a 9'-0" ceiling.

4. Locate and place onto left wall a door following the specifications on floor plan.

5. To aid in the placement of the "furniture" (simulated by scale model cubes) use black ink to indicate a 1'-0"x1'-0" grid on the floor of the model.

6. Use black ink to indicate a vertical height line on the back (15'-0") wall.

7. Attach walls and floors of the model by using a generous amount of pins or tape to ensure stability.

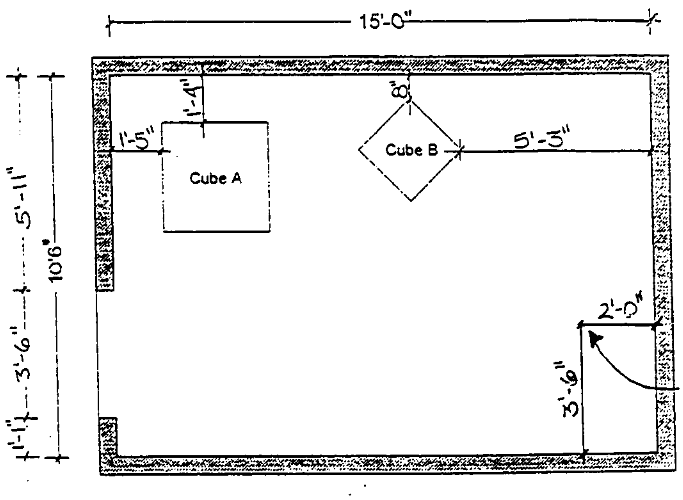
B. Furniture

1. Cube A: Construct a 3'x3'x3' cube out of foam core board. Place in the position indicated on the floor plan.

2. Cube B: Construct a 2'x2'x2'cube out of foam core board. Place in the position indicated on the floor plan .

3. Scale model figure: Place the scale model figure in the position indicated on the floor plan.

D3. Experimental Treatment (Scale Model) Instructions (1 of 3)



SCALE MODEL FLOOR PLAN

Scale 1/4"=1'-0"
9' ceiling
wall thickness 6"

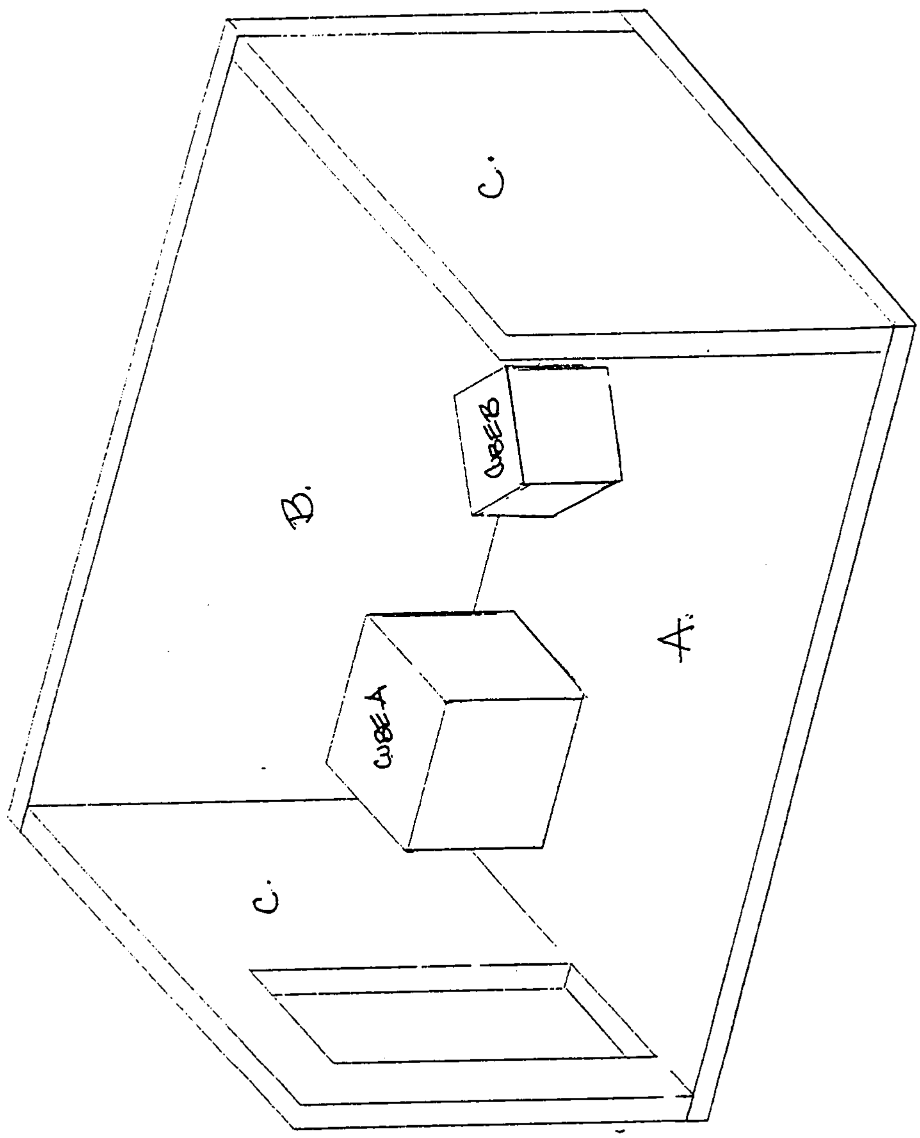
1. Construct the walls

2. Locate and construct a door opening.
OPENING SPECIFICATIONS:
3'-6" x 6'-6"
Place on left wall.

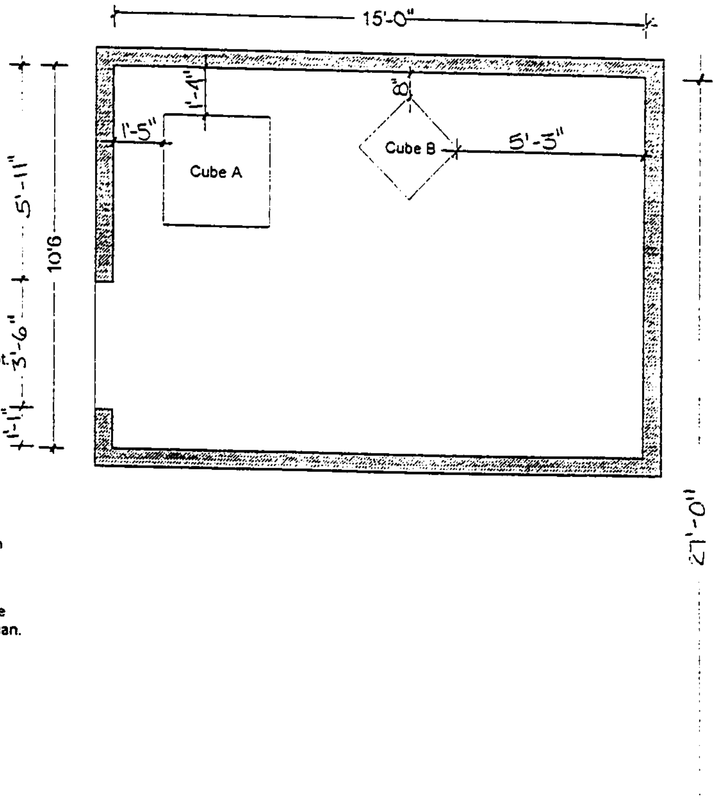
3. Cube A: Construct a 3'x3'x3' cube in the position indicated on the floor plan.

4. Cube B: Construct a 2'x2'x2' cube at a 45 degree angle in the location indicated on the floor plan.

D3.1 Experimental Treatment (Scale Model) Instructions (2 of 3)



D3.2 Experimental Treatment (Scale Model) Instructions (3 of 3)



POST TEST EXERCISE
Please complete the following steps IN ORDER.

Scale 1/4"=1'-0"
9' ceiling
wall thickness 6"

1. Construct the walls in a one pt. perspective according to instructions.

2. Locate and construct a door opening.
OPENING SPECIFICATIONS:
3'-6" x 6'-6"
Place on left wall.

3. Cube A: Construct a 3'x3'x3' cube in the position indicated on the floor plan.

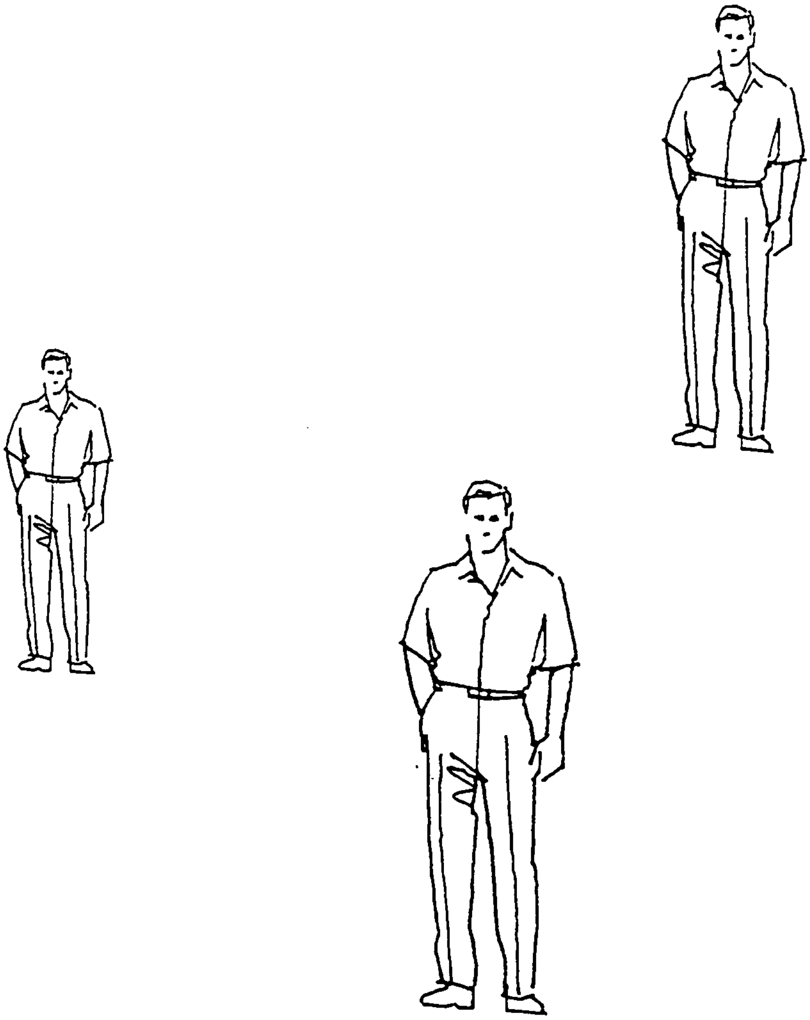
4. Cube B: Construct a 2'x2'x2' cube at a 45 degree angle in the location indicated on the floor plan.

Station Point is located:
5'-0" from right interior wall
27'-0" from back interior wall

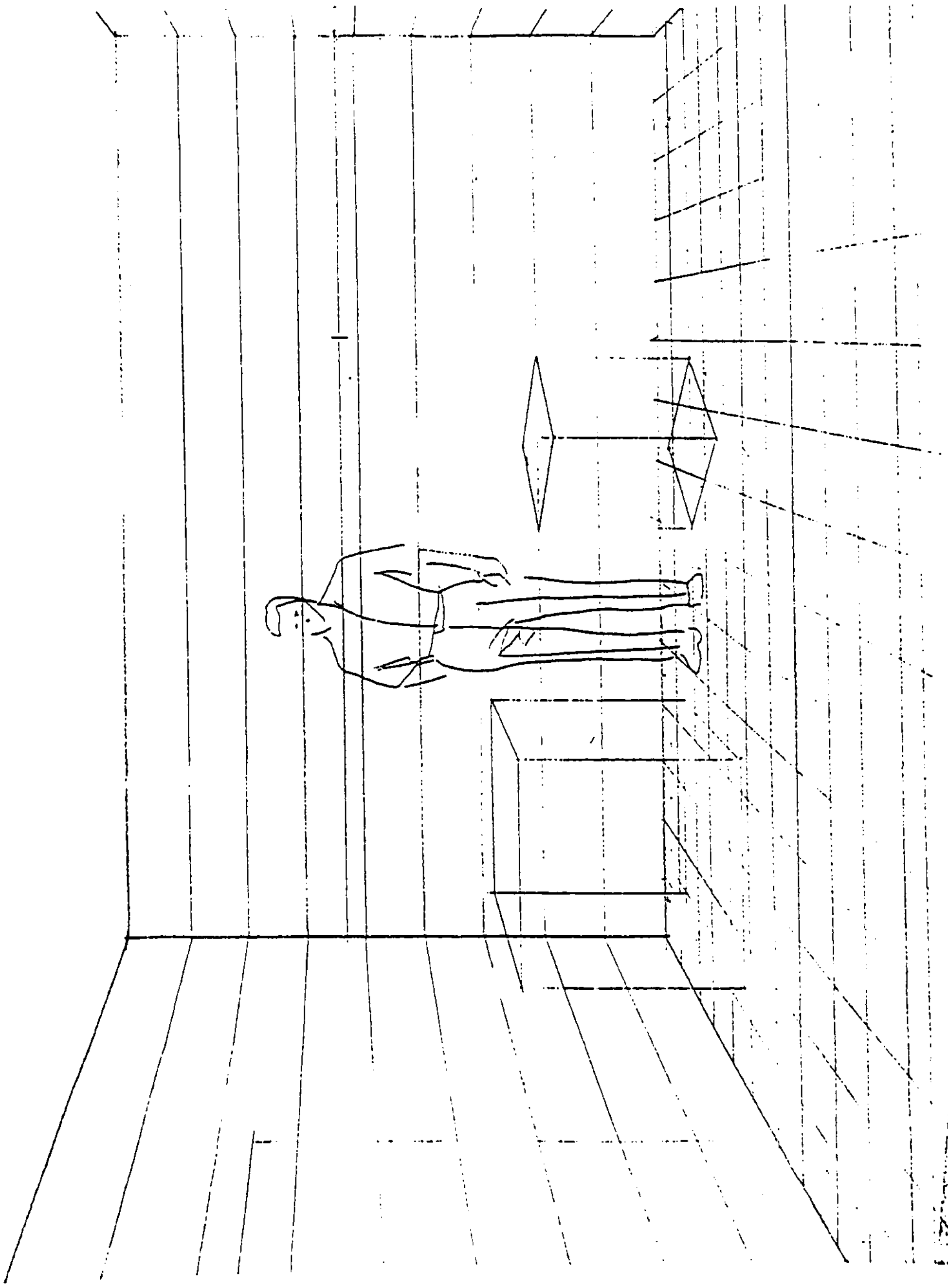
STATION PT.

D4. Post-Test Instructions

Trace the **most appropriate sized man** in your perspective. Locate him to stand within three feet from the back wall and positioned between Cube A and Cube B.



D4.1 Post-Test Scale Figure Instructions



D5. Completed Post-Test Drawing

APPENDIX E

SURVEY QUESTIONS

CONTENTS- APPENDIX E

Survey Questions, Group A

1. In what ways was your perspective drawing the similar or different than you thought it would be from seeing it in the floor plan view?
2. Were there any surprises that you did not expect in the difference of scale or proportions from the floor plan to the perspective drawing?
3. If so, what were the surprises?
4. Please add any additional comments:

E1. Survey Questions, Group A (Control Group)

Survey Questions, Group B

1. Was your perspective drawing the same or different than you thought it would be after constructing the scale model?
2. In what ways was it different?
3. Were there any surprises that you did not expect in the difference of scale/ proportion of the scale model reproduction and the perspective drawing?
4. If so, what were the surprises?
5. In what ways did the scale model facilitate the perspective drawing process?
6. In what ways did the scale model *not* facilitate the perspective drawing process?
7. Please add any additional comments:

E2. Survey Questions, Group B (Experimental Group)

VITA

Julie Mathews was born in Knoxville, Tennessee on March 19, 1969. She graduated from Bearden High School in June, 1987. She entered The Florida State University, Tallahassee, Florida during August of 1987. She entered the F.I.D.E.R. accredited Interior Design Program, and received a Bachelor of Science in Interior Design in 1992. After graduation, she moved back to Knoxville, Tennessee to practice residential interior design. In January of 1996, she entered The University of Tennessee, Knoxville to pursue the Master of Science in Interior Design. While in school, she continued to practice freelance interior design and work for The University of Tennessee as a graduate teaching assistant, a resource librarian for the Interior Design Program, and as a teaching instructor. The masters degree was received May, 1998.